SCIENTIFIC AMERICAN

[Entered at the Post Office of New York, N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION, ART, SCIENCE, MECHANICS, CHEMISTRY AND MANUFACTURES.

Vol. XLIV.—No. 10. [NEW SERIES.] NEW YORK, MARCH 5, 1881. [$3.20 per Annum. [POSTAGE PREPAID.

MAMMOTH FIRE BOAT.

The tendency, of late years, to erect large and high buildings has been such that our present system of combating fires is in many cases wholly inadequate for the purpose. Buildings are now erected double and treble the height they were twenty years ago, while our means of combating fires in them remain practically the same. The miniature fire engine used in Turkey has its use in extinguishing fires in the shops and bazaars of that country, but would be wholly useless here or in London or Paris. Our old hand engine did good duty when we had small two-story houses, but it had to give way to its more powerful rival, the steam fire engine, when our cities became larger and buildings higher. But the present steam fire engine, powerful though it be, has in many cases shown itself completely inadequate to combat fires in large and high buildings. Many of our large structures have a thousand tons of combustible material n them, each ton of which, in burning, will give off heat sufficient to evaporate ten tons of water. Therefore the heat generated would dissipate ten thousand tons of water, and, moreover, only a small fraction of the water used ever reaches the fire.

Fully one half of the fires in New York and Brooklyn are confined to the river front, where an unlimited supply of water is at hand, only requiring steam power to place it where it will do the most good. In our engraving on this page will be seen a new fire boat, which has been designed by H. S. Maxim, M.E., of this city. Mr. Maxim proposes to make a fire boat on a grander scale than has ever been thought of heretofore — one that shall have power sufficient to completely and almost instantly extinguish any fire, great or small, that may be within its reach. The hull is of iron, 250 feet long and 40 feet beam. She has two complete engines, so that one wheel may back while the other goes ahead, thus enabling her to turn, as it were, on a pivot, or to move in almost any direction. The space below the deck is full of machinery. The boilers, 3,000 horse power, are so constructed that their full force may be used either on the paddle wheels or on the pump. The engines are of the compound type, using steam at 80 pounds pressure to the square inch. The pumps are of the compound duplex pattern, and are of great size and strength, being able to convert the full energy of the boilers into power for projecting a stream of water. The novel features of this boat consist of the vertical stand pipe and the two discharge pipes mounted on trunnions, as shown in the engraving. The stand pipe connects with the pump below deck, and may be revolved in any direction, while a telescopic joint admits of running it up or down. The lower discharge pipe is designed to extinguish fires on shipboard or for sinking a ship. It has a nozzle of 20 inches diameter, which, of course, is immense, considering that it has the sea for a supply and 3,000 horse power to force it. The top

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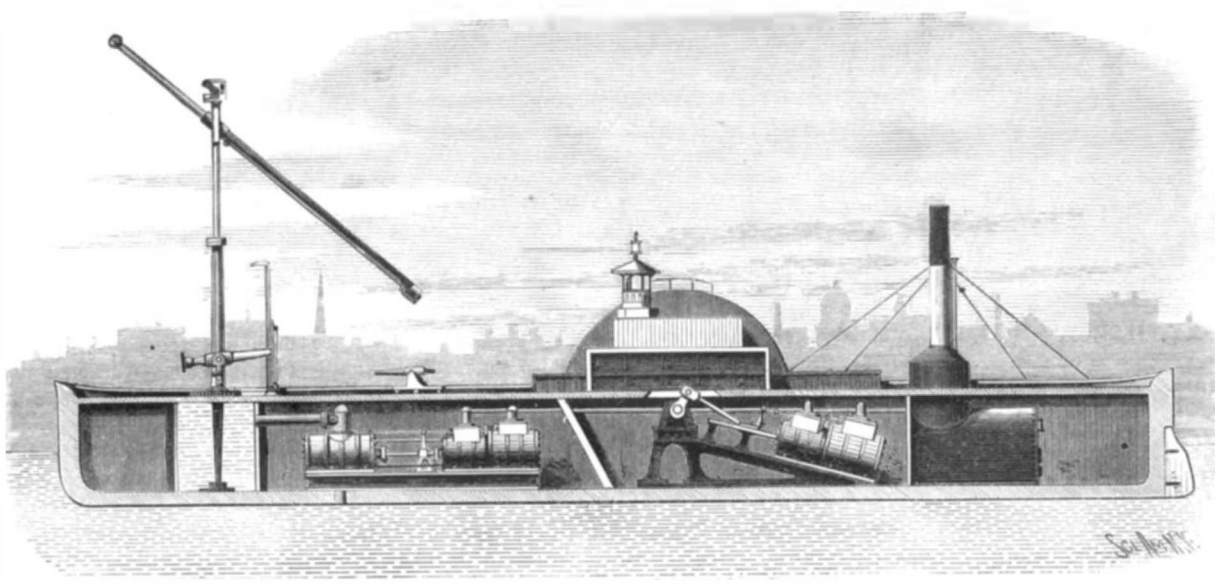

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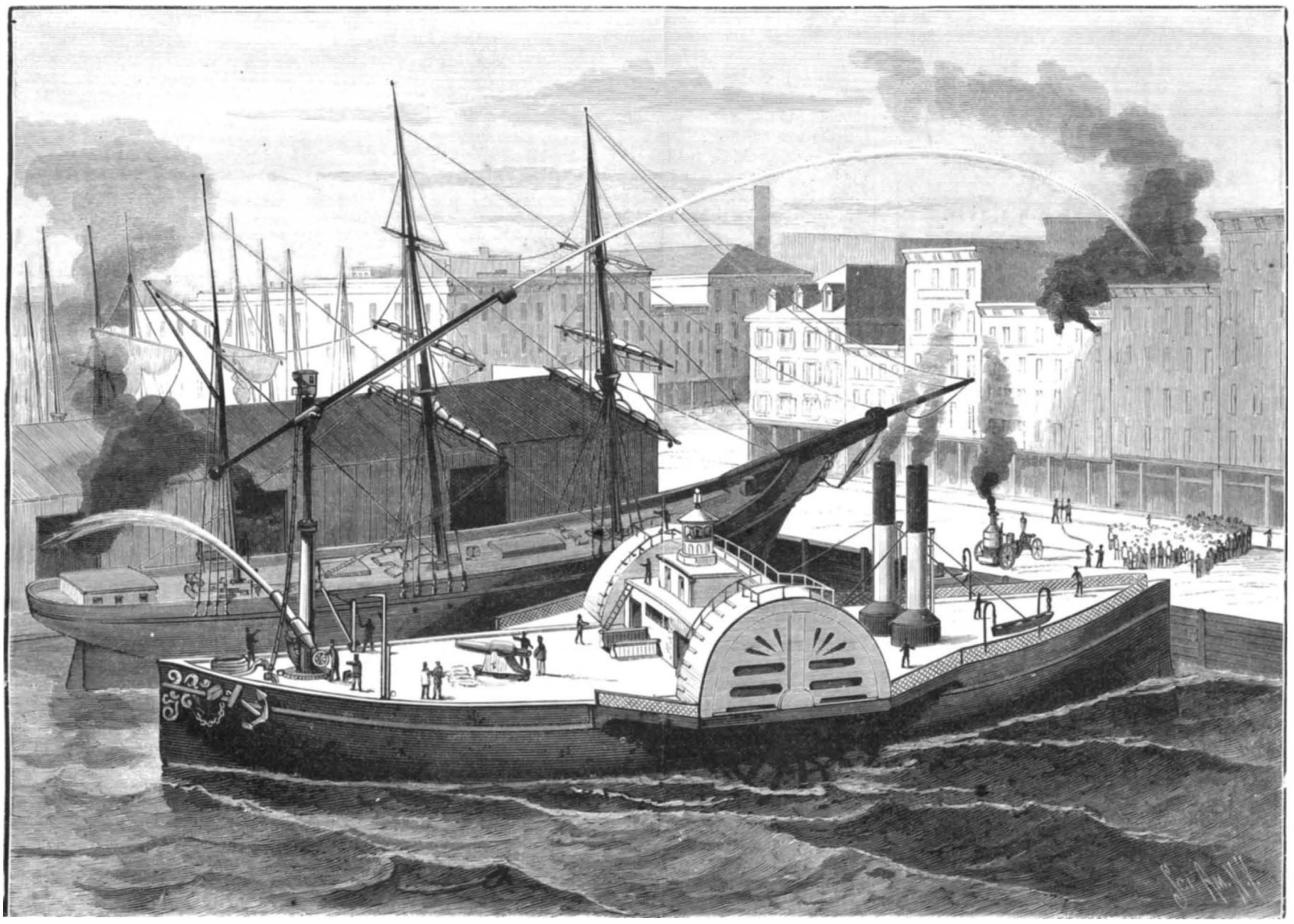

MAMMOTH FIRE BOAT DESIGNED BY H. S. MAXIM, M.E.

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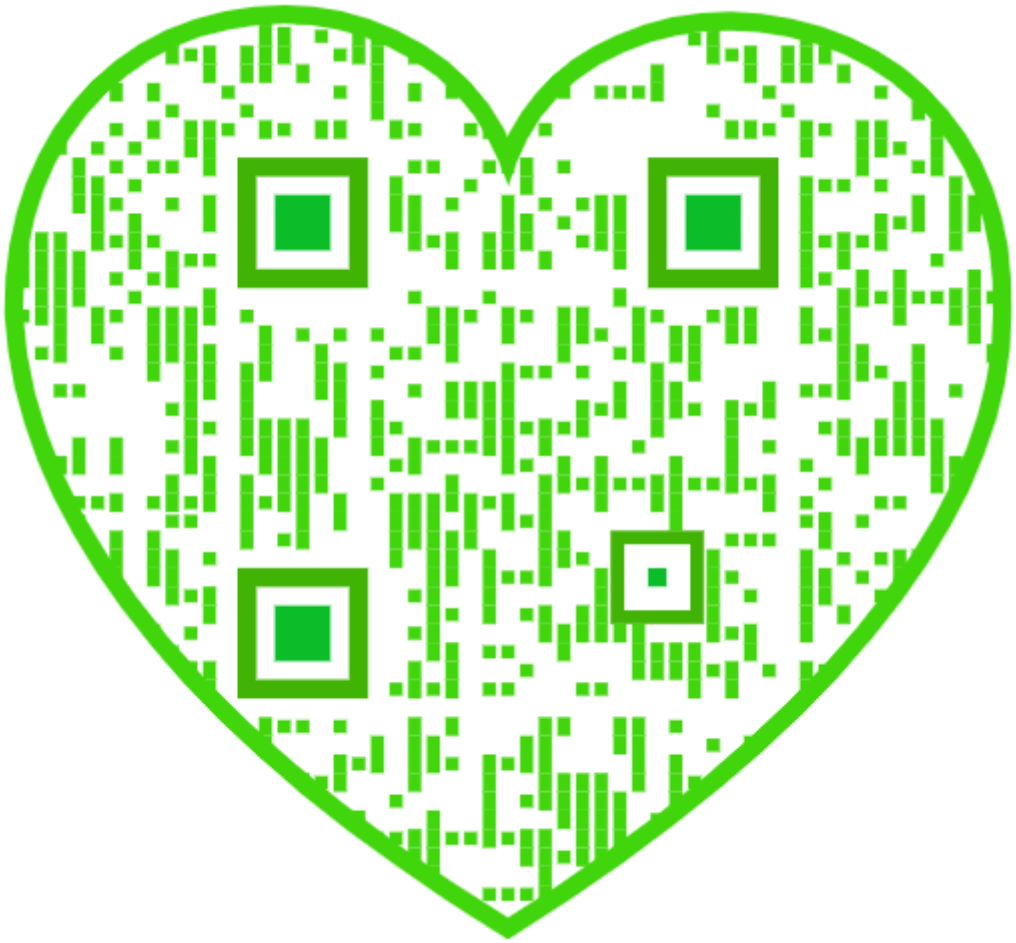

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT
NO. 37 PARK ROW, NEW YORK.

O. D. MUNN. A. E. BEACH.

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TELEGRAPH WIRES IN CITIES.

The ice storm which so seriously interfered with electric communication in and around this city recently, exposed many defects in the usual method of supporting telegraph and telephone wires. The rapid restoration of the lines to working efficiency has strikingly exhibited the inherent convenience and value of aerial lines.

How to secure immunity from such interruptions in the future, without laying too great a burden upon the owners of wires, and without restricting the easy extension of electric communication, is a problem of no small importance.

The first demand, particularly from those who had no property interest in telegraph or telephone lines, was that the practice of setting up wires on poles and houses should be stopped, and that all electric wires should be put under ground.

In response to this demand a bill was introduced in the New York State Legislature to secure such a placing of wires within city limits before July 1, 1882. The bill provided that after the date given it should not be lawful to use any wire above ground for telegraphic, telephone, or electric lighting purposes, except indoors. In framing this bill its author neglected to take account of the conditions under which private lines of electric communication are set up and operated.

Granting the feasibility of putting underground a large part of the wires—which is far from evident—the requirement that all wires shall be so placed would be little less than prohibitory in the case of private wires, since the cost of the work would outweigh any possible benefit. Besides, the frequent upturning of the streets for the extension of such lines, were it otherwise practicable to bury them, would be a nuisance quite unbearable.

The exigencies of modern business and social life require not only the widest extension and the cheapest maintenance of electric service attainable, but also its readiest extensibility. This, not by great corporations solely, but by individuals. It is a common thing nowadays for business houses to supplement the facilities offered by the telegraph companies and telephonic exchanges by maintaining from one to a dozen or more private lines. The public will not willingly assent to any curtailment of such facilities.

The relatively low cost of aerial lines, and the ease with which they can be set up and repaired, make them in many instances of this nature the only available means of electric communication. As for lines which might go underground the question would arise, Which is the greater nuisance, the poles for the support of aerial lines, cabled or separate, or the frequent tearing up of the pavements for extension, alterations, and repairs, if the lines are buried? Then would come the difficult problem of determining whether the subways for telegraphic, telephonic, and electric lighting wires should be owned by the city, or whether some company or combination should be allowed to acquire a monopoly of the means of electric communication within the city limits.

Plainly the time has not come for an abandonment of aerial lines. While the sinking of through lines should be encouraged, if it can be done without introducing greater evils than the change is intended to cure, the first effort should be to improve the modes of supporting and distributing the existing lines. The difficulty with these lines, as they are, arises chiefly from the insecurity of their supports, the lack of concert of action in their erection, and the absence of any orderly supervision of their distribution.

It may be that legislation will be required to remedy these evils, but that should be had without difficulty, and without necessitating any sweeping change in the systems, or endangering in any way the freedom and economy of electric service.

There is ample room on the roofs of houses for such an orderly distribution of aerial wires as would meet the public requirements and avoid at the same time the unsightly tangle of wires now prevailing. There is no great objection to the supporting of wires on houses if the supports are properly placed and sufficiently strong. Hitherto individual permission so to place wires has had to be obtained. The essential value and necessity of electric service would seem to justify the granting of the right of way over houses for the running of wires in some systematic manner, the damages to be assessed and met in the usual way. Under such legal privileges, restraints, and regulations, most of the confusion, misplacing, imperfect supporting, and other faults of aerial lines, could be corrected and the way left clear at the same time to extend our systems of electric communication unlimitedly.

ANOTHER IMPORTANT REISSUE DECISION BY THE SUPREME COURT.

The tendency of recent decisions of the Supreme Court of the United States, with regard to reissued patents, lately commented upon in this paper, received another illustration in the decision delivered by Mr. Justice Swain in the case of Densmore *et al. vs.* Scofield *et al.* (December 20, 1880), appealed from the United States Circuit Court for the Northern District of Ohio.

It would appear that the complainants had patented a method of attaching to ordinary flat cars over the trucks two large wooden tanks for holding petroleum while in transit on railways, so as to carry the oil in bulk instead of in barrels or other commercial vessels. Subsequently, after the well-known iron tank car had come into general use, the patent was reissued. The specifications of the reissued patent were so drawn as to cover not merely the original two tanks and the method of attaching them to the car, but "their equivalent when constructed and operated in combination with an ordinary railway car"—that is to say, any form of tank car.

Suit being brought for infringement, the answer set up, among other defenses, that the reissued patent was too broad and was therefore void.

The court saw fit to disregard this plea, deeming it proper to dispose of the case upon a more radical and comprehensive objection. After citing the unimpeached and uncontradicted testimony of witnesses called by the appellees, to the effect that the complainants' wooden tanks had been discarded for reasons given, and that the use of return casks placed and fastened as described in the patent had been practiced for twenty years or more, the court said:

"This testimony leaves nothing of the substance of the plaintiffs' alleged invention. . . . But, irrespective of this testimony and of any testimony, upon looking this reissue in the face and examining its several claims by their own light, we find nothing that brings any of them within the sphere of what is patentable. There is no novelty and no utility." On this ground the Supreme Court pronounced the entirety and all the particulars of the claims "frivolous and nothing more."

"Patents rightfully issued," the court observed further on, "are property, and are surrounded by the same rights and sanctions which attend all other property. Patentees as a class are public benefactors, and their rights should be protected; but the public has rights also. The rights of both should be upheld and enforced by an equally firm hand, whenever they come under judicial consideration."

A few more decisions of this tenor should put an end to the practice which has wrought so much injustice to the public and brought so much discredit to the patent system, we mean the extension of obscure and often trivial patents so as to make them cover, on reissue, valuable processes or products not within the scope of the original.

PHYSICAL TRAINING AS A MEANS OF MENTAL HEALTH.

One of the serious problems which modern science encounters is how to deal with—more particularly, how to prevent—the excessive nervous development, and through that the frequent mental failure or derangement characteristic of modern life. The mad poet's sarcastic remark, that brains had brought him to the asylum—a fate his interrogator ran no risk of—was bitterly true; but it is not volume of brain so much as an unbalanced development of brain that leads to insanity or a liability to that distressing malady. That the rapid, eager, restless, anxious life which the most of us lead tends to produce an increasing complexity of the nervous system, all physiologists agree. That this complexity of nervous organization lays us liable to the development of a condition of unstable mental and nervous equilibrium is only too clearly proved by the statistics of our asylums.

What are we to do? We cannot radically change our style of living to that of our slow-going ancestors; on the contrary, the indications are that our children's children will, by contrast with their more active life, look back upon our age as measurably serene. It is remotely possible that a new order of invention may reverse the tendency of the race and relieve the future of much of the mental and nervous strain which we have to endure; but it does not look that way now. The immediate future, at any rate, is pretty sure to intensify the conditions which so many break down under to-day. Must the mental breaking down increase in frequency in proportion? Or can we pitch upon some means whereby the rising generation can be fitted to endure the strain which will come to them, better than the men and women of to-day bear the burden of to-day?

A generation ago the popular theory was that mental discipline, with the brain development which early and long-continued schooling gives, would furnish the capacity for mental work and mental endurance which would best fit the coming man for the work he would have to do.

The result has been to increase the work to be done, and the speed of doing it, without materially increasing man's capacity for toil. In many instances the course of education pursued seems rather to have lessened the endurance of our people, and to have hastened the mental collapse of many of our brain workers.

And the school children of to-day have more to do than their fathers and mothers had, and have to bear no inconsiderable portion of the evils of modern life besides; that is, if constant excitement, haste, and worry are to be accounted obstacles to healthy mental and nervous development. That they cannot fairly be considered beneficial is sufficiently evident.

Speaking of the nervous excitements and their results, due to our modern education and the rate and manner of our living, an eminent English physician (Dr. Browne, editor of the *British Medical Journal*) says: "The cerebral tissue becomes more and more highly organized, convolutions obtain secondary gyri, and with each differentiation in structure, new possibilities of disturbances are introduced; while the very differentiation in question produces in turn new mechanical devices, which again introduce a more complicated mode of life with which the nervous system must keep pace."

If there were no possible corrective to this tendency to increase the nervous strain of life more rapidly than the nervous organism can acquire power to endure it, the inevitable destiny of civilized men would be the madhouse or something near it. But there is promise of such a correc-

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tive. The late Dr. Seguin demonstrated many years ago, that the undeveloped brains of the feeble minded could be stimulated to healthy growth by patient and systematic training of the muscles and the organs of sense. Dr. Browne looks to a corresponding physical culture of those of normal brain endowment to give them the increased brain capacity which will fit them for the severer needs of our increasingly active intellectual life, and at the same time make them better able to resist the inroads of mental disease.

"Muscular exercise," he says, "has been hitherto thought to expand the lungs, quicken the circulation, and brace the nerves; but to this must now be added the pregnant idea that it also contributes to the brain growth and mental evolution. As a large part of the brain is composed of motor centers, we may, in the nascent state of the organ, powerfully act on the brain, by putting into methodical exercise the muscles which we know to be directed by its various parts; and especially the centers governing the movements of the hand ought to be brought into training by careful drill of manual movements, so that, in due time, a cunning right hand may be the servant of every man to some mechanical art, and of every woman to some technical work."

And not only is it possible, as Dr. Browne suggests, to fortify the young against the inroads of mental and nervous disorders by the development of brain capacity, stability, and symmetry, through manual training, but there is gained also, by means of such training, the additional safeguards, which come from much dealing with realities, from having always at hand the means of healthful recreation, and from the conscious ability to do, if necessity compels, something that will win support.

Industrial education thus takes on an importance far greater than has hitherto been accorded it. It becomes a necessity, not merely to those who are likely to spend their lives as artisans, but even more to those who may never earn a day's wages at the bench—men of independent fortune, professional men, business men and women in all the walks of life, to whom physical training may mean not bread and butter, but mental health.

STEAM ENGINES FOR ELECTRIC LIGHT MACHINERY.

A field for the manufacture of steam engines specially adapted to the propulsion of dynamo electric machines has been opened by the recent extensive and rapid development of the electric light.

It is the aim of inventors and manufacturers of electric lamps to provide automatic adjustments which will secure the greatest possible uniformity in the light, and these adjusting devices are called upon not only to compensate for unequal combustion of the carbons, but also for the irregularities of the propelling power, every variation of which produces a corresponding variation in the strength of the electric current. This effect is more strikingly illustrated in electric lamps of the incandescent variety, by whose regular fluctuations the strokes of the engine may be sometimes counted. The highest measure of success in electric illumination demands the employment of high speed engines running with great uniformity.

It requires but little reflection to perceive that as the electric light is the continuous product of mechanical energy, it must be of primary importance to uniformity in the product that the supply of energy should be uniform.

Sir J. W. Bazalgette, in his report upon the electric lights which have proved so successful on the Thames Embankment in London, states that the success reached is in great measure due to the remarkable steadiness and regularity of movement in the 20 H. P. steam engine which supplies the lights, and which was built by the Messrs. Ransomes and fitted with their patent automatic expansion gear. This engine, during a period of twelve days, running at an average speed of 142·36 revolutions per minute, has been found to vary not more that one-twelfth of a revolution under suddenly varying loads.

In view of the progress which this kind of illumination is making in this country, together with the great variety of automatic governing valve gear of great excellence in use, it would pay some of our best engine builders to give attention to this special class of work. The field is large and constantly growing, and offers rich promise to enterprise.

NEW THEORY IN REGARD TO LUNAR VOLCANOES.

M. Faye, according to the *Chronique Industrielle*, recently delivered a lecture at the Sorbonne, in which he criticised the prevalent belief that volcanoes exist on the moon, and offered a theory of his own to account for the objects that have been taken as craters due to volcanic action. Water, said he, is the sole cause of volcanic eruptions. Now, on the moon there is no atmosphere; this is a fact recognized by every one, and it is absolutely confirmed by observation of occultations. Since there is no atmosphere there, of course there can be no water, for the latter would instantly evaporate under such conditions, even did it exist. So, since there is no water in the moon, it follows that there can be no volcanic action and consequently no volcanoes. But there are circular cavities on the moon, nevertheless. What are they, then, and how have they been formed? To account for these, M. Faye asked his auditors to imagine a river frozen over from shore to shore. Such being the case, the tides will exert a pressure on the under surface of the ice, and if a hole exist in the latter the water will quickly issue up through it and congeal around its edges. And so each successive outflow will freeze over its predecessors until the successive layers form a marginal ring of some height around the aperture. From this we may get an idea of the alleged lunar volcanoes, which are diametrically the opposite of those that exist on the earth. The craters of our terrestrial volcanoes, that of Vesuvius particularly, are at the top of high mountains; the craters of the so-called lunar volcanoes are, on the contrary, in the center of low hills. The bottom of terrestrial volcanoes is greatly elevated above the mean level of the surrounding land; that of the alleged lunar ones is deep down beneath the surrounding ground. Terrestrial volcanoes are conical mountains thousands of feet in height, having at their summit a crater some hundreds of feet in depth, while the circular cavities on the moon are wells several thousands of feet deep and surrounded by a sort of curb some hundreds of feet in height. The circular hollow called *Copernicus*, for instance, is 11,000 feet deep, while its marginal hill is only about 2,600 feet in height. These circular cavities, then, are veritable wells, and they were formed, according to M. Faye, as follows:

At the epoch in which the moon, covered with a thin solid layer, took less than a month to accomplish its revolution around the earth, tides were created on its surface by the latter. The incandescent and liquid mass, covered by a thin coating that might be well compared to an egg shell, was attracted by our planet and thereby caused to dash up against this solid layer. Now, if we suppose that small orifices were accidentally created in various parts of the still thin crust, the waves formed by the tide would cause some of the molten mass to issue through these apertures, while the surrounding crust would everywhere else resist it. This liquid would flow over the edges of these well holes, and being unprotected against the cold of space would at once solidify. And, as we have just seen in the case of the frozen-over river, at every tide the margin would increase in height by the superposition of new outflows. Finally a moment would come in which the bottom would itself solidify. But this being situated at a great depth, and being protected against external influences, would remain for a short time in a pasty condition. If at such a moment a new flux should take place, the middle of the pasty bottom would be thrust up, and in solidifying would remain considerably elevated in comparison with the surrounding portions of the bottom. Thus may be explained the existence of the peaks which are observed in a large number of these lunar cavities.

Such is an outline of M. Faye's new theory. "If," says the author, "I am asked by what considerations I am led to make known the results of my observations and researches, I answer that I am seeking, first, to banish from science a gross error by proving that these lunar cavities are not volcanoes, for no explosion can take place where there is no explosive material. Then, again, from a geological point of view, I have wished to study in the formation of the moon those phases of the past which may give us an idea of the phases to come. Although the geology of the moon differs completely from that of the earth, this very opposite nature is a valuable element of discussion. It will serve to banish vain theories and to put in a clearer light the phenomena of which the earth has been the theater."

WHITE ANTS IN COURT.

An intimation of the mischief done in regions infested with white ants, by the wood destroying habits of these insects, is furnished by a recent law suit in New South Wales. The plaintiff, a contractor, had received from the defendant instructions to repair a house which had been damaged by white ants. As the work proceeded, the plaintiff found that the house was almost eaten away by the white ants, and that a considerably increased expenditure would be required to put the house into thorough repair, and he informed defendant of the fact. The bill for the work done was disputed as excessive.

A considerable amount of evidence was taken on both sides as to the work performed, and it was stated that an estimate could not be given of the contract price of work, as the white ants operate during darkness, and the extent of their ravages could only be seen as the work progressed. One witness described the house as being so seriously injured that new material would be required throughout, and the best way to have dealt with it would have been "to put a fire stick under it." The estimated cost of the repairs before the work was begun was about $1,150. The defendant had paid $2,000, and the court adjudged that he should pay $230 more.

THE HUMANE ASSOCIATION'S CATTLE CAR COMPETITION.

The first result of the American Humane Association's offer of an award of $5,000 for an improved stock car, capable of carrying live animals long distances without suffering or having to be unloaded to be fed and watered, appears to be an accumulation of business not at all anticipated by the officers of the association, and not altogether in harmony with objects for which the society was organized.

The judges' circular, No. 2, dated Feb. 1, acknowledges the receipt of 420 models and about 200 plans and sketches; and (since Jan. 1, the limit set to the receipt of plans and models) they have been overwhelmed with correspondence asking why the award is not made or the models, etc., returned In other words, the office of the association has been turned into a sort of local patent office, for the work of which it was ill prepared. The judges suggest that, even if they neglect their own business and devote their entire time to the examination of the models, plans, etc., and the comparison of them with the 111 U. S. patents already granted for stock cars, several months must elapse before a decision can be arrived at. Indeed it is likely that months will have to be devoted to clerical and expert work before the special competitive examination by the judges can begin. When made, the result will be announced to the association, as specified in the circular of July 12, 1880.

Obviously the competitors will have to be patient; and if any one feels himself slighted by the silence of the association he should first make sure that his model has been received or was intelligibly marked, since thirteen of the models received had no names or addresses on them, and it is probable that others are lying unclaimed in express offices for lack of prepayment of charges.

A TELEPHONE REISSUE.

The Patent Office, after careful hearing, has granted to Mr. E. Berliner, a reissue of his original telephone patent, of January 15, 1878, with several new claims, among which is one that virtually awards to the above author the priority of invention and use of the local battery in conjunction with telephone instruments.

Prior to the invention of Mr. Berliner it was necessary to yell very loud in order to make anybody hear at any considerable distance through the telephone, and even then the speaker's voice was heard quite faintly.

But now, with this improvement added, the telephone is rendered so sensitive that conversation in whispers may be readily carried on, and the ordinary tones of conversation are delivered by the instrument in the most perfect and admirable manner. Mr. Berliner is entitled to the highest honor for his remarkable invention, which is now used in all parts of the world. The patent is held by the National Bell Telephone Company, of Boston, Mass.

Spontaneous Combustion of Dyed Goods and Yarn.

The heaviest loss that has occurred in 1880, within the line of mutual insurance, has again been caused by the spontaneous combustion of dyed cotton yarn of various colors; and while this particular fire opens some entirely new questions that are now under investigation, it gives us reason, says Mr. Edward Atkinson, President of the Boston Manufacturers' Insurance Company, to renew our warning against a danger which has been the cause of thirty per cent of the losses that we have incurred since January 1, 1878, a period of two years and nine months.

Blacks, browns, slates, and Turkey red goods, dyed with cutch, gambier, aniline, iron liquor, and chromic acid, appear to be most liable to oxidation, if rolled hot or warm from the dry cans or piled hot from the dyeing kettles. In almost all the premises insured by us, complete arrangements have been made for thoroughly cooling cloth and yarn as it comes from the cans or kettles, or special fireproof apartments have been provided for storing rolls of cloth from the dry cans over night. Yet, within the first month, hot rolls of cloth have been found by one of our inspectors in one of our risks.

This last fire discloses the fact that old yarn, some of it imported five years since, and some made two years since, that had been softened with a mixture or emulsion of olive oil and soda to prepare it for knitting, took fire spontaneously when stored in the attic of an old-fashioned mill, where the heat was doubtless excessive.

Whether the combustion ensued from the emulsion or from the dyestuffs is the point now under investigation, but it is evident that care should be taken not to expose some of these colors to excessive heat, whether the goods are freshly dyed or old.

The present indications are that the combustion in this case occurred from the oxidation of the dyes used in the black yarn, combined with the olive oil used in the emulsion, as we have succeeded in promoting spontaneous combustion with this color, but not with any other of those that have been prepared for our trial, precisely like those stored in the attic of the mill burned.

American and French Silks Contrasted.

Foreign correspondents complain very much of the miserable quality of the silks and satins from the Lyons looms; that, as they scarcely outlast half a dozen wearings, plush, brocade, and Sicilienne take their place. This emanates from France, but the English have for several years previously acknowledged the superiority of the American silks, brocades, damasses, and armures, as well as gros-grains, which are free from all injurious matter, and will neither crack nor fray, but outwear several French silks. Another great defect in black silk is "wearing shiny," which comes from the action of the soap and alkali developing a grease under friction. Cracking arises from the strain of the delicate silk to carry the heavy load of iron, potash, logwood, soda, oil, soap, and other chemicals used in foreign treatment. Raveling a thread from the silk, passing it through, and straining it over the fingers, is a good test. In heavily dyed silks the thread will feel rough and lumpy, and if a small quantity be burned it will simply smoulder, leaving a yellow, greasy look, while if pure it will immediately be consumed to a crisp, leaving only a pure charcoal. A new feature in silk trade has been the importation of raw silk from Asia through the Suez Canal and the Mediterranean direct to New York, though the greater part of the Asiatic importation of silk comes across the Pacific Ocean, and is brought here by rail.—*N. Y. Tribune.*

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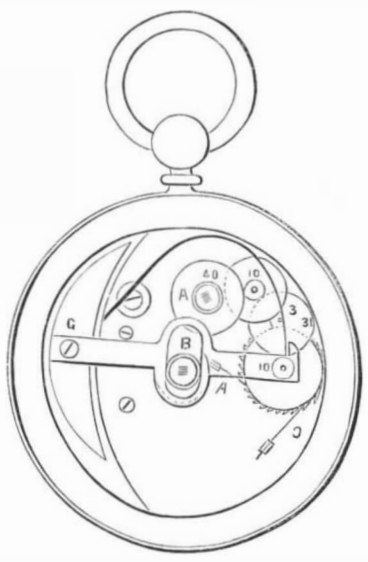
SELF-WINDING WATCH.

The annexed engraving represents a device for winding a watch by means of the motion of the wearer's body in walking, which has been patented by A. R. von Loehr, of Vienna, and described in the *Horological Journal*.

It will be observed that the mechanism is in principle the same as that which constitutes the pedometer. The inventor is aware that the motion of a weighted lever has been used before for winding a watch, but he claims to have overcome the objections existing in former arrangements.

A weighted lever, G, is pivoted at one end, and kept in its normal position against the upper of two banking pins, as shown, by the long curved spring. The strength of this spring is so adjusted that the motion of the body in walking is sufficient to cause the lever to descend to the lower banking pin at each step. There is a ratchet-wheel with very fine teeth, pivoted at the same center as the weighted lever, and fixed to the lever is a pawl, *A*, which engages with a ratchet-wheel. It is considered a special feature of the invention that this pawl is made very elastic, in order to take up the strain arising from any tendency of the pendulum to vibrate after the mainspring has been fully wound up. A is the barrel arbor, and the connection between it and the ratchet-wheel is made by means of a train of wheels, as shown; *B* is a second pawl to prevent the return of the ratchet wheel.



LOEHR'S "PERPETUAL" WATCH.

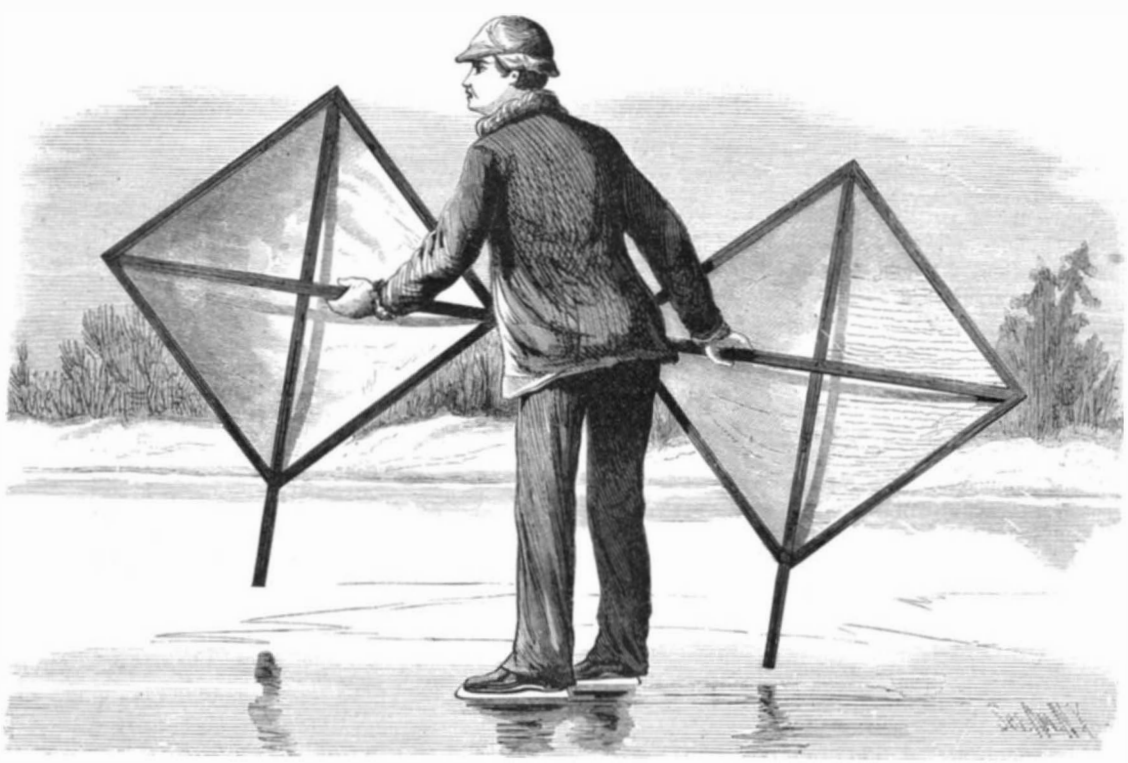
It is urged that a watch wound in this automatic manner yields a better rate, by reason of the lesser range of mainspring in use, than when wound in the ordinary way.

In connection with this invention is an up and down indicator, with a revolving dial, which does not need special description.

For setting hands there is a disk, B. which has a milled surface, slightly cupped to suit the point of the finger.

SKATE SAILING.

The new sport of skate sailing appears to be making fair progress toward popularity. In some places—as at Havre de Grace, Md., where our artist sketched the figure in the illustration herewith—the sails appear to be used also as a means of easy and rapid transit for other purposes than amusement. In the main, however, their chief use must be to increase the scope and variety of winter sports; and for this purpose they have the merit of cheapness as well as of capacity for calling out competitions of endurance, grace, and skill. The successful skate-sailor has to be a practical navigator; and probably there is no better or more enjoyable way of learning the action of the wind upon sails, or the effects of sail positions upon the motion and stability of a craft, than by converting one's self into both craft and crew. For pleasure sailing the vertical standards, as shown in our illustration, are sometimes omitted, their use being simply to support the sails when the human craft is at anchor. The framework which carries the sails is of light and simple construction, and the spread of canvas is easily adjusted to the strength and skill of the user. With a fair expanse of suitable ice the skate-sailor can perform all the evolutions of an ice yacht, and possibly may be able, like the ice yacht, to outstrip the wind. The advantage of having two sails lies in the better outlook afforded, enabling the sailor to see his course under all circumstances, and removing the liability to collisions and other mishaps incident to the use of a single sail.



SKATE SAILING.

Bread Making in the East.

On our return an instructive sight awaited us. We saw how bread was baked in an adjoining building. It was done with a rapidity which explains how of old the supply was prepared every day, and how if some guests arrived the housewife could make the necessary provision without delay (Gen. xviii., 6.)

Among the Fellaheen the dough is generally leavened. A large round hole in the ground, some one and one-half feet deep, and the same in diameter, forms the oven. In this lie some live coals, which as in Hosea's time (Hosea vii., 6), are not allowed to go out at night, and when baking has to be done are again revived.

The housewife first forms a lump of dough with her hand, then suddenly spreads it out with an indescribably rapid action of both hands—which can as little be imitated as a conjurer's movement—into a cake as thin as a leaf, which with a moistened dab or rag she presses into the hot oven, where it remains sticking. In a minute it begins to move, and is at once taken out to make room for the following one.

The bread is now ready, not thicker than parchment, not very relishing, and somewhat sandy on the outside, but really very enjoyable for any one who has a good appetite. Although of the size of a large plate, such a slice contains but little nourishment, and Jeremiah could hardly have been saved from starvation when only one such piece of bread was given him every day.—*Obell.*

A Canadian Sewing Machine Factory.

While the industries of Canada are, as a rule, the reverse of flourishing, Montreal boasts of an establishment which, thanks to excellent management, energy, and abundant capital, is not only holding its own, but is steadily increasing in capacity, scope, and financial prosperity. This exceptionally prosperous establishment is devoted to the manufacture of the Williams improved sewing machines, and is owned and operated by the C. W. Williams Manufacturing Company, of which Sir Hugh Allan is president, Mr. Andrew Allan vice president, and Mr. D. Graham managing director.

The C. W. Williams Manufacturing Company, of Montreal, was organized in 1863, and incorporated in 1872. It was formed by several of Montreal's most prominent, far-seeing, and successful business men and capitalists, most of whom are still its stockholders and directors. Foremost among these is Sir Hugh Allan, whose name is so frequently found in connection with successful Canadian enterprises. The first factory situated on St. Germain street soon became too small to satisfy the increasing demand for the Williams improved machines, and last year arrangements were made for the erection of a factory building on a scale sufficient, it was thought, to meet all probable calls on it for many years to come. Accordingly, a site was chosen at St. Henri, a populous suburb of Montreal, and the three story and basement building was erected and fitted with the latest and most approved machinery for the manufacture of sewing machines. Already the business of the company has doubled, and extensive additions must be made to the new factory.

Thus far the company have found no need for a store room, the demand for their machines being such as to prevent any accumulation of stock. The city salesroom of the company, at No. 347 Notre Dame street, Montreal, is connected by telephone with the factory

The improved machine manufactured by this company is adapted to any and every kind of work, and for the past eight years has obtained the first prize at all the Provincial exhibitions held in Canada at which prizes have been given. It ranked with the first at the Centennial Exhibition in Philadelphia, and gained the only first prize at the Sydney Exhibition of 1878, in a contest with fourteen other competitors, including the leading American makes.

The managers state that their business of 1880 was three times as large as that of any former year, and the present year gives indications that the sales of 1881 will be double of those of last year.

The American market for these machines is supplied through a branch establishment at Rouse's Point, N. Y.

Railway Prizes.

Mr. Hinton R. Helper, a wealthy resident of St. Louis, and well known throughout the country as the author of the "Impending Crisis," some time ago offered $5,000 in prizes for three prose articles and two poems in favor of the construction of a double track steel railroad through the centers of North and South America. The prizes have been recently awarded as follows: First prize, $1,300, to F. R. Hilder, of St. Louis; second prize, $1,200, to Fred A. Beelen, Cortland on Hudson, N. Y.; third prize, $1,000, William W. Archer, Richmond, Va.; fourth prize, $1,000, F. D. Carpenter, Washington, D. C.; fifth prize, $500, F. A. Deekens, Norwich, Canada. The first three were in prose and the last two in poetry. They are to be published in pamphlet form.

NEW DROP ATTACHMENT FOR BOTTLES.

The engraving shows a simple device for delivering liquids from bottles in drops as slowly or rapidly as may be desired. It consists of a tube inserted in the stopper and provided with a flexible air bulb for blowing air into the bottle, and another tube inserted in the stopper through which the liquid escapes. By pressing upon the rubber bulb with more or less force the liquid is made to escape with more or less rapidity.

BRAVAIS'S DROP ATTACHMENT FOR BOTTLES.

This device will be found particularly advantageous in dropping medicines, and it may in many instances replace the pipette used by chemists. This invention was recently patented by Mr. Raoul Bravais, of Paris, France.

MECHANICAL INVENTIONS.

Mr. Cyrus Smith, of Irwin's Station, Pa., has patented a smoke-consuming furnace which is an improvement on an invention patented by him February 4, 1879. A peculiarly constructed exhaust fan, gas, and air mixing-chamber devices for removing ashes, etc., are the features of the invention

Mr. Charles F. Crary, of New York city, has patented an improved burglar alarm and door fastening. The fastener can be attached to the knob spindle in such manner that the latter cannot be turned sufficiently to unfasten the door. The fastening is also connected with an alarm gong, which gives warning in case it is tampered with.

Mr. Manuel de la Torre, of Mexico, Mexico, has patented a turbine wind motor which consists of a wheel with curved vanes rotating on a vertical axis within a cylindrical frame which is closed on two opposite sides. The wind entering the wheel on one side escapes at the other. The frame is controlled by vanes to admit more or less air to the wheel according to the velocity of the wind.

Mr. John Till, of Canton, Pa., has patented an improved printing press constructed to perform easy, rapid, and accurate work. A four-sided frisket frame, which revolves one quarter of its circumference for each impression that is made by and between the rocking bed and the platen, is employed, together with other novel points of construction.

Mr. James Murphy, of San Antonio, Texas, has patented an improved bench clamp for carpenters' and cabinetmakers' use, whereby pressure may be brought against the ends of any object to hold it in position on the work bench. It is strong, durable, and inexpensive, requires no bolts or screws to hold it on the bench, and is easily and quickly put in position or removed. It occupies small space, and can be applied to any piece of work without marring it.

Mr. Ethelbert J. Moore, of Villisca, Iowa, has patented a concussion spring for vehicles which consists of a rubber plate having upon its face rubber blocks in the shape of truncated pyramids placed between the bolster and bed of the vehicle, by which construction the shock of light or heavy loads is sustained with equal effectiveness.

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NEW HATCHELING DEVICE.

The engraving represents an apparatus for hatcheling or straightening and removing the gummy matter and roots from hair combings or other snarled and tangled hair.

The invention consists in a bed or table fitted with hatcheling and combing teeth arranged in a peculiar manner. These teeth are carried by blocks fitted to slide in the bed to allow change or removal of the teeth and the substitution of fine and coarse teeth one for the other, as required.

The bed, A, is screwed fast to a suitable table, and carries the hatchel, *a*, and combs, *b*, *c*, and *d*. The hatchel and comb teeth are sustained in blocks, *e*, fitted in dovetail grooves or mortises of the bed, A, so that they may be removed when desired.

The teeth of the hatchel, *a*, are arranged in four parallel rows with the required number in each row, two rows being of round teeth and two of flat teeth placed alternately. These teeth are secured in place by being driven through holes in the block, so that they may be adjusted as required.

The comb, *b*, is for gumming the hair, and is fitted in a diagonal position at the left of the hatchel as the operator stands.

The coarse rooting comb, *c*, is placed across the end of bed, A, and *d* is the fine rooting comb, placed at the opposite side of bed in a diagonal position. This arrangement of the combs gives the greatest facility for the successive operations, especially if more than one operator is at work with the apparatus.

The teeth of the combs, *b*, *c*, *d*, are needle-pointed, and are soldered at their lower ends between metal strips fitted in slots in their respective blocks, so that the teeth may be removed from the blocks for cleaning or the substitution of others.

In using the apparatus the operator stands facing the hatchel, *a*, and holding the hair in the right hand, draws it toward him through the teeth of the hatchel. In the same manner the hair is drawn through the gummer, *b*, the teeth of which remove the gummy matters and dirt.

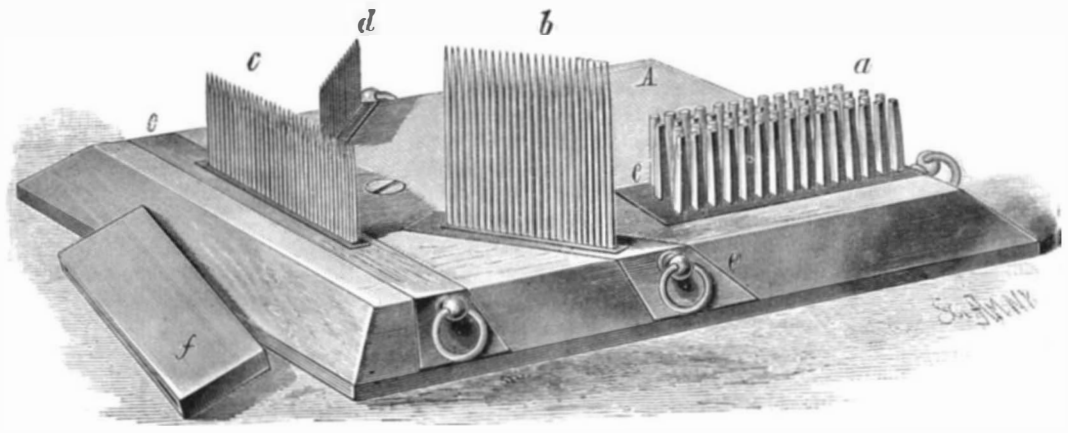
In using the rooting comb, *c*, the operator stands at the end of bed, A, and taking the hair in small locks, draws it through the comb, at the same time pressing the hair toward the base of the comb with the left hand, so that the teeth will remove the roots. If the fine rooter, *d*, is required the operator stands at the back of the bed, or the block, *h*, and comb *d* may be put in place of comb *b*, and the operator stand in front of the machine.

The blocks, *e*, are each fitted with a ring for drawing the block out, and when two persons are working on the same machine these blocks may be drawn out partially, so as to give more room for working.

The combs are covered by metal caps, *f*, when not in use to keep them clean and preserve the teeth from injury. By the use of this apparatus the work of hatcheling, gumming, and rooting tangled hair can be readily and quickly done.

The hatchel teeth are arranged in four parallel rows, two of fifteen round and two of fourteen flat teeth, placed alternately in the block and secured by being driven through holes, so as to be adjustable for cleaning or putting in new teeth. The round teeth keep the hair from being cut or broken, causing it to separate as it is drawn through. The flat teeth receive the knotty and matted hair as thrown off from the rounded teeth and hold it while the good hair is drawn through, they also keep the hair down toward the base and prevent it from slipping off the hatchel.

This invention was recently patented by Mr. Aaron D. Cheney, of Three Oaks, Mich.



CHENEY'S HATCHELING DEVICE.

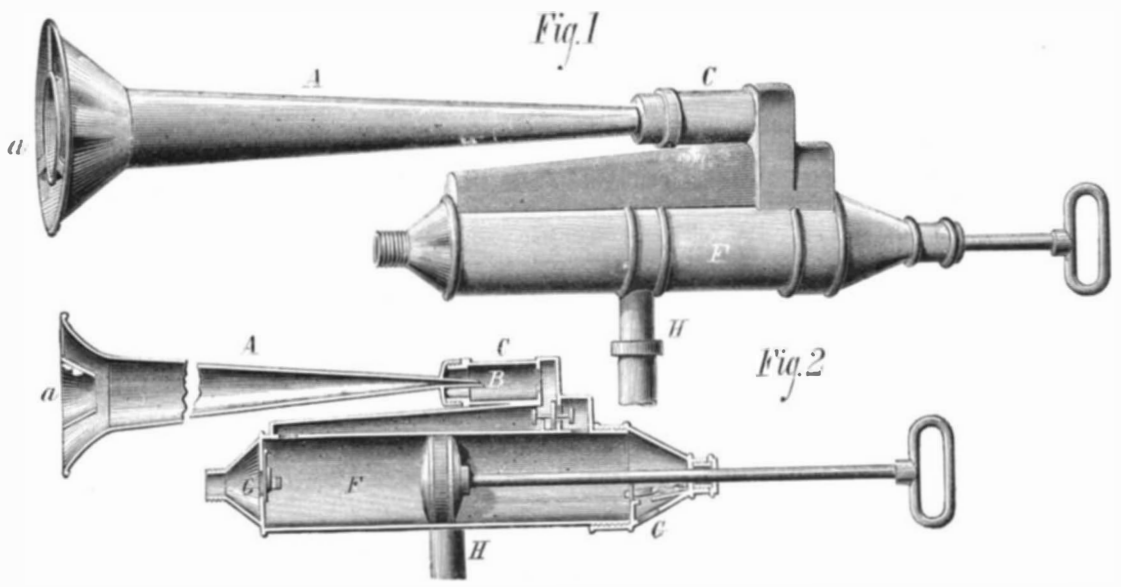
IMPROVED FOG HORN.

We give an engraving of an improved fog horn lately patented by Mr. Richard Chester, of Chicago, Ill. It is designed more particularly for sailing vessels and boats not propelled by steam. It is of the simplest character, and may be worked by one or more men.

The trumpet, A, is of the usual form, and at the larger end is provided with a conical disperser sustained in place by radial arms. The smaller end of the trumpet is inserted in the chamber, C, and provided with a reed, B.

The chamber, C, communicates with the air cylinder, F, whose piston is moved by means of a handle at the end of the piston rod projecting through a stuffing box at the end of the cylinder. Air enters at either end of the cylinder through valves; G, and is forced through a passage containing a check valve into the air chamber, C.

The details of construction may be clearly seen in Fig. 2, which is a longitudinal section of the apparatus. By a reciprocating movement of the piston the air is compressed sufficiently to give strong blasts from the horn, which may be heard long distances.



CHESTER'S FOG HORN FOR VESSELS.

Motive Power and Machinery of a Mill.

A gentleman of ample experience furnishes *Leffel's Mechanical News* the following sensible hints for millers: The first requisite is good motive power, and among all hydraulic motors yet discovered none can compete with a good turbine, for the following leading reasons: The turbine is not affected by ice; it is not affected by backwater, save the loss of power due to the loss of head; it is much cheaper in first cost; it is more cheaply and easily transported and erected; it is suited for all heads and all locations; and, above all, it is more economical in the use of water, for its high velocity dispenses with the cumbrous double gearing which is absolutely necessary with under or over shot wheels. Look well to your foundations, both of the building and of the penstock and flume. Never connect the husk of a mill with the frame of a building; it should be framed entirely separate, for the stones will work better and will not be thrown out of level by the settling of the building. In planning a mill, study how to render it complete with as little machinery as possible. Above all, avoid complications in machinery, which waste power and cause delays and expense for repairs.

The Geological Survey of Pennsylvania.

In a long account of the progress of the State geological survey of Pennsylvania, the *Press*, of Philadelphia, gives the following information of general interest: The survey has been going on six and a half years, and two and a half years more will be required to complete the work. Forty-two counties have been fully surveyed and eighteen partially; six counties remain untouched. The anthracite coal field was entered upon for the first time the past season in the Mahanoy and Wilkesbarre districts. The publication of the reports has nearly kept pace with the field work. Twenty-eight county reports and sixteen special reports are already in print, and thirteen of the former and three of the latter are in preparation.

One of the most valuable results of the season's work is a third report on the oil regions, with maps and illustrations, prepared by Mr. Carll, who has a high reputation as an expert. A special paper, which promises to be of great importance, has been prepared by Mr. Franklin Platt on the waste in anthracite mining. This report is now going through the press, and will be laid before the Legislature at an early day, having been prepared in response to a call by that body for such a report. Professor Lesquereaux, who is the leading fossil botanist of the world, has prepared a volume of nearly 700 pages on the fossil plants of the State, which is said to be the most perfect work of the kind in existence, and Dr. Genth, who has been making a special chemical investigation of the slate, gneiss, and trap rocks, has made some remarkable mineralogical discoveries.

NEW INVENTIONS.

Mr. Rufus M. Brundige, of New York city, has patented an improved dust and wind guard for windows. A plate having eyes at its ends and bent rods for supporting the plate, whereby the plate can be adjusted at either side of the window, constitutes the invention.

Mr. James N. Lee, of Natchitoches, La., has patented an improved portable chamber for hot air, vapor, warm water, and similar baths. The invention consists of a portable bath chamber formed of a detachable, top, and of sides made with sections hinged to each other, provided with doors having glass lights and openings for stovepipes, the whole resting on a base frame provided with a stove or furnace for heating the chamber.

Mr. Leonard Tilton, of Brooklyn, N. Y., has patented an improved canceling stamp, which can be readily manipulated to bring it into the desired position on the bed, and which gives a uniform pressure in stamping to insure plain marking.

Mr. Edward Heyde, of East Saginaw, Mich., has patented a boat rowing apparatus, the object of which is to facilitate the working of oars of boats by a better application of the power of the rower. It dispenses with ordinary rowlocks, and makes use of the weight of the rower in working the oars. The boat is provided with a rocking seat, upon which the oars are supported, their inner ends being pivoted to a central standard rising from the seat between the supports. The motion of the operator causes the seat to rise and fall, and thereby carry the blades into and out of the water.

A novel foot bath recently patented consists of an oval vessel with a half cover set at an angle to deflect the steam toward the limbs and to prevent clothing from dropping into the water, and when blankets are used, as in taking a steam bath, it forms a support for them. It is provided with a special device for adding hot water, and forms a very desirable article. Mr. R. B. Robinson, 145 Broadway, is general agent.

Experiments in Gunpowder.

From our English contemporaries we learn that several new descriptions of prismatic powder are being prepared at the Royal Gunpowder Factory at Waltham Abbey for the future experiments of the Committee on Heavy Guns and Explosives. The prisms will be of various forms and sizes, and some will be perforated to accelerate combustion. The researches into the properties of prismatic powder have engaged military and scientific men of various nations for many years, but it is only of late that the introduction of air spaces into the cartridges has given a direction to experiments and developed the full advantages of the system. Some powders of this description made in Russia and Germany have recently been tried, and the German prisms, which are about an inch long, have been found to be the best yet produced. The government works at Waltham Abbey have manufactured some prisms so large as to weigh 4¾ oz. each "grain," but this powder has been discarded as overstepping legitimate growth, and the qualities about to be tested will probably not exceed 1½ in. in length, or rather more than 1 oz. per grain. There is now very little doubt that, in some form or other, the explosive material for employment with great guns in the future will be prismatic gunpowder.

MATCHES.—There are in the United States about 28 establishments, large and small, devoted to the manufacture of matches, about 4,000 persons being employed in the business. The trade, however, is monopolized by six or seven more prominent concerns, of which the Barber Match Company, of Akron, is the largest.

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Correspondence.

The Coming Electrical Exhibition at Paris.

To the Editor of the Scientific American:

The Committee of Organization has been somewhat modified, and the names of Count Du Moncel and Dr. Cornelius Herz have been added.

The funds necessary for organization will be partially furnished by the government and partially by a guarantee society, the members of which have subscribed a certain amount of money.

The Emperor of Germany signed a decree on the 4th of January, in which he promises the participation of Germany in the Congress of Electricians and the Electrical Exhibition. The Government of Holland has also made an official announcement of the participation of that country.

The Government of Belgium has nominated as delegates to the Congress Messrs. Banneux and E. Gerard, Telegraph Engineers. In Italy the Minister of Public Instruction and Public Works is also making preparations for the participation of that country in the Exhibition.

In the last session of the seventy members of the Organization Committee some new and important facts concerning the Exhibition were announced, which it may be interesting to mention here.

The Commissary General, Mr. George Berger, communicated to the assembly that the power which will be at the disposition of the exhibitors will amount to 800 horse power, which, besides furnishing power for moving the machinery, will be sufficient to have 600 lamps burning imultaneously. This fact alone is sufficient guarantee to the public that the exhibition will be a brilliant one. A large hall will be connected by telephones with the Grand Opera, and the experiment of transmitting the music of the choirs and of the orchestra in this way from the Opera to the Palais de l'Industrie will be tried.

Several electric railroads will be erected, and, it is reported, Mr. Siemens, of Berlin, has announced that he will expend 150,000 francs for the construction of the new railway which has been used with such grand success in the Prussian capital.

A note read before the Academy by Mr. Blondlot throws some new light upon the properties of selenium metal, an element much spoken of since the invention of the photophone by Mr. Graham Bell.

Mr. Blondlot has, by means of a platinum wire, attached to the one pole of a capillary electrometer, a fragment of annealed selenium metal, and to the other pole a platina plate. When the selenium was brought into contact with the platina (using for this purpose insulating handles) and then quietly kept there, the electrometer remained at zero, but as soon as the platina was rubbed with the selenium, the electrometer showed a great deviation, similar to that produced by a sulphate of copper battery. Mr. Blondlot has shown that neither the rubbing of two metals with each other, nor that of an insulating body with a metal, nor that of two insulating bodies, is able to produce a deviation of the capillary electrometer.

The current produced in the experiment described moved the electrometer around in the direction from that part of the selenium which was not rubbed to that part which had been rubbed, and it may easily be ascertained that the thermo-electric current, which is produced by heating the contact point of the selenium and platina, moves from the warm part of selenium to the cold part of the selenium, consequently the electric current produced by the rubbing cannot be ascribed to the *heat* created by the rubbing of the two elements.

If, after the electrometric deviation had been obtained, the rubbing ceased, this deviation remained. This phenomenon is due to the fact that the selenium, which had permitted the electric current to pass through it while in the high tension produced by the rubbing, afterward opposed a resistance which could support the feeble polarization of the mercury of the electrometer. A shock given to the selenium, or even a pressure, produces the same phenomenon, although in a less marked degree.

There is much talk in Paris in regard to a new telephonic system, a description of which Mr. Kroetlinger, of Vienna, has just published in the *Angewandte Electricitaetslehre.* This system is based upon the variations of the intensity of thermo-electric currents, the apparatus being so arranged that the heat can be modified by the vibrations of the voice. Mr. Kroetlinger uses a thermo-electric battery consisting of long elements, one end of which is kept at a comparatively low temperature, while the other is heated by the upper part of a candle flame. The candle is kept at a constant height by a mechanism similar to that used in carriage lamps. Surrounding the front and the sides of the battery there is a telephonic mouth-piece, which is placed in an invariable position.

The diaphragm of this mouth piece is flexible, and is pierced by a great number of holes varying in size, and the whole apparatus is surrounded by a box, which prevents the interference of exterior noises, and through which only the mouth of the telephone and the poles of the thermo-electric battery enter.

This disposition permits a change in the normal conditions of the air current (which is heated by the flame) to take place by means of the vibrations created by the voice. The corresponding variations of the heat acting upon the thermo-electric pile may be easily determined.

These variations create variations of the same nature in the current produced by the battery, and consequently the words are reproduced in the telephonic receiver, which is connected with the wires in the battery.

Experiments made with this telephonic arrangement have given very satisfactory results, and the idea is certainly of great scientific interest.

Paris, January 19, 1881.

The Late Dr. Sandford.

To the Editor of the Scientific American:

With your permission I would correct the unjust reflection upon Dr. Sandford in the article entitled "An Unwise Physician," published in the January 8th issue of the SCIENTIFIC AMERICAN, my attention having just been called to it. First, let me say that my information is principally obtained from a friend who assisted the doctor in the operation of tracheotomy, which proved so fatal to himself.

The little one on whom the operation was performed was *not* a patient of Dr. Sandford, as reported; neither had he watched the patient "night and day," but was called by the attending physician to perform the operation, which he had successfully done on other occasions.

The child had been under treatment for "membranous croup," and not diphtheria, as stated.

Had the doctor supposed for a moment it was the latter he would never have resorted to the knife, as it would then have been a useless attempt. Had it been "membranous croup" the fatal consequence would not in all probability have occurred.

It is asserted that a rubber tube was used, through which the membrane was drawn. This is also incorrect, as nothing was used for that purpose until afterward, when a silver tube was inserted, through which the child breathed.

It is customary in such operations, I am informed, to open the windpipe, which allows the lungs to inhale rapidly; when filled the sudden exhalation drives the membrane out through the opening. In this case, for some reason known only to himself, the doctor, seeing the membrane, and thinking to be more sure, without previous intent apparently, clapped his mouth to the open wound and drew the membrane out.

In reply to a suggestion by my friend that it "would be bad for him if diphtheria was there," he said, "Yes, it would!" and immediately rinsed his mouth with water.

It was not until this moment apparently that he thought of diphtheria.

The doctor's large heart and anxiety to save human life, rather than "professional zeal," prompted the act.

The act of drawing the membrane with the mouth perhaps cannot be justified, as the consequence cannot always be foretold. An inspirator should be used in such cases.

The doctor was familiar with the operation, having performed the same successfully on several occasions; also had written several papers on the subject.

A young man in years, but stood far in advance of many older practitioners by his untiring study and labor.

His loss is mourned by a large circle of friends, and it is but just to his memory, his friends, and science, that the above errors be corrected. E. G. R.

A Steam Boiler Explosion.

The Keystone Council of Stationary Engineers, of Philadelphia, in the case of a boiler which exploded at Allentown on the 6th of January, after summarizing the evidence, say: In the first place we find malconstruction; the boiler hung at the extreme ends, with no support for the center, and the hole in the shell being cut out the full size of the dome, which tends to weaken the shell of this diameter very much, and the fourth sheet being five-sixteenths thick and the fifth sheet three-eighths thick, while all the sheets should have been the same thickness. The one sheet being heavier than the other, the heavier sheet tends to pull the lighter sheet apart, from the difference of their expanding qualities. We find the bad workmanship in the riveting, the holes not being even, and the rivets being too small for the holes—the holes being three-quarters of an inch and the rivets five-eighths—and from the evidence, the pressure has been carried far in excess of a safe working pressure for a boiler of this size and thickness. As we estimate the strength of a boiler by its weakest part, we would judge the character of the iron as it presents itself to be able to sustain a tensile strength of 52,000 pounds per square inch, and reduced 44 per cent for single riveting, and the thickness being five-sixteenths—the boiler being 36 inches in diameter—the bursting pressure would be 505 pounds, and one-sixth of the bursting being the safe working pressure (by our city ordinance), the safe working pressure would be 84 pounds. This would be the safe working pressure of the rim that gave way, the fourth sheet; while the fifth sheet, being three-eighths by the same rule, would give a bursting pressure of 606 pounds and a safe working pressure of 101 pounds. This would be a calculation of a boiler, new and first-class workmanship, and being hung from three saddles, distributing the weight. When we consider the weight o the boiler at 6,000 pounds and a weight of 8,000 pounds of water and 5,000 pounds of bricks and mortar laid on top of the boiler, there is not much wonder why it gave way in the center, particularly by the assistance of at least 90 pounds per square inch on the heads, which would be the mean between 60 and 120 pounds, which would be equal to a force of 91,608 pounds pressure on the heads, tending to pull the boiler apart in its curvilineal seams, while the curvilineal seam in its full strength, admitting it to be equal to 52,000 pounds per square inch, and reducing it 44 per cent for riveting, and it being 113 inches in circumference, its tensile strength would be 1,028,300 pounds, and one-sixth of this being a safe load for it to bear, would be 171,386 pounds, and subtracting 91,608 pounds, which would be the pressure of steam exerted on the head by a pressure of 90 pounds, would leave us 79,778 pounds as a surplus to support the weight of the boiler; weight of water and weight of bricks and mortar would be 19,000 pounds. There is not much wonder that the boiler gave way in the center, which, theoretically and practically, is the weakest point, when hung from the ends, and no support for the center. The boiler should undoubtedly have been condemned before the last patch was put on; the boiler is evidently a great deal older than six years.

DECISIONS RELATING TO PATENTS.

United States Circuit Court.—District of New Jersey.

FLOWER *v.* RAYNER.—PATENT FOR DECORATING TIN PLATES.

Nixon J.:

1. The statutory provisions concerning reissues require that the original patent must be inoperative or invalid either from a defective or insufficient specification or from claiming as new more than the patentee has the right to claim; and, in addition to this, the error which is sought to be corrected must have arisen by inadvertence, accident, or mistake, and without any fraudulent or deceptive intention. If the party interested can bring himself within these conditions and limitations, the Commissioner is authorized to issue a new patent for the same invention. When the original shows upon its face that the grounds and reasons for the reissue do not exist, or where a comparison of the letters patent discloses different inventions, the reissue is void, as an act unauthorized by the law.

2. The reissued letters patent No. 7,556, dated March 13, 1877, for improvement in decorating tin plates, cans, etc., held to be invalid, as being an undue expansion of the original letters patent.

United States Circuit Court.—District of Delaware.

WILT *v.* GRIER.—PATENT FRUIT DRIER.

Bradford, J.:

This is a bill in equity brought by the complainant Wilt against the defendant Grier for alleged infringement of said Wilt's Letters Patent No. 190,368, issued May 1, 1877, originally to A. Quincy Reynolds, of Chicago, Ill., for an improvement in automatic fruit driers.

1. Where a person procures a patent for the building of a machine which produces certain results which are novel and useful, by reason of certain mechanical contrivances and appliances, any person who attempts to accomplish the same results by mere substitutions, which are equivalents of the means employed by the first patentee, is an infringer.

2. Any application of known mechanical powers which will produce that result, although different in form from the means employed by the orignal patentee, is a mechanical substitute and equivalent of the same.

How Raisins are made in California.

In Mr. Blowers' vineyard, Yolo county, the grapes are allowed to remain on the vine until of a golden color and translucent. Then they are picked and put on wooden trays two by three feet in size, placed between the rows, sloping to the sun. When half dried they are turned by putting a tray on top, and by inverting them both, are transferred to the new tray. When the grapes lose their ashy appearance, and after removing the green ones, the rest are put into large sweat boxes, placing sheets of paper between every twenty-five pounds of raisins. They are left there for two weeks, when the stems are tough and the raisins soft. The packing follows, in which iron or steel packing frames are used, the raisins being assorted, weighed, inspected, and made presentable. Mr. Blowers prefers a rich, moist, sandy loam, in a warm climate, for raisins, and believes that winter irrigation will destroy insects and keep the vines in a thrifty condition. He prefers to plant vines eight by ten feet apart, or even ten by ten feet, and uses fertilizers.

What Becomes of the Soapstone?

The *Times*, of Bethlehem, Pa., is anxious to know what is done with the soapstone which is largely quarried and ground at Easton. The industry has lately received a wonderful impetus, and the mills are running day and night. The product is shipped to New York; thence where? "It is claimed to be used in paper pulp. It may be," the *Times* says, "to some extent. It is alleged to be used in hatter's felt. Perhaps so; but where is so large an amount disposed of? Soapstone, or steatite, is a combination of silica and magnesia. It is soft and greasy, and hence it is sometimes called lardstone. From its adaptability to making vessels, in some sections it is called pot rock. When ground, it is a soft, smooth, greasy, and almost impalpable powder. No one who has seen it in its ground state will question its almost diamond value for adulteration. Candies, sugars, flour, butter, it is alleged, can be adulterated to the extent of 20 to 25 per cent without any chance of detection."

Fortunately detection in such cases is not at all difficult. Dissolve the suspected candy or sugar; the insoluble mineral will remain. Burn a sample of suspected flour; an excess of ash will betray the cheat. Melting and filtering will do the same for suspected lard or butter.

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MAMMOTH FIRE BOAT.

[*Continued from page* 143.]

discharge is 60 feet above deck, and the nozzle is 60 feet long from the trunnion. It may be moved up or down or turned in any direction; when at its highest elevation the nozzle is 100 feet above the deck.

A novel feature connected with this discharge pipe is the variable sizes of discharge nozzles, which are arranged in a cylinder like the chambers of a revolver, and may be changed without stopping the flow of water. The cylinder has five separate nozzles; namely, 6 inch for great distances and very high pressure, 8 inch for less distance, 10 inch for fires near at hand, and a sprinkler, consisting of one hundred three-quarter-inch diverging openings. The nozzles may be changed and the discharge directed by a single operator placed in a cab situated on top of the stand pipe. All the movements are made by the agency of small steam engines. When we consider that this boat can throw a ten inch stream of water, which is 100 times the size of a steam fire engine nozzle; that, instead of being thrown from the ground and nearly all its power lost in raising it to the fire, it is thrown from a height of 100 feet, and with a force great enough to break through iron blinds, wooden shutters, doors, or roofs, and that the force of the water would be such that it would be dashed into a spray of sufficient volume and density to fill every nook in a large building; that a large floor could be flooded in one minute, and that the largest fire possible in any building now erected could be extinguished as quickly as a fire in a drygoods box or barrel could be extinguished with old appliances—some idea of its great power can be formed. In addition to the fire-extinguishing features, she is also provided with a means for demolishing walls, staving in sides of ships, and for making fast to ships that are in flames.

For demolishing buildings in case of great fires, the usual mode has been to place under or near to them a large quantity of gunpowder. This was resorted to in Boston, but with poor success; its action is uncertain and unreliable. It often occurs that a fire is inclosed in a strong room with heavy walls, and that there is no means of getting a stream of water on to it. In such cases it becomes necessary to make an opening in the wall. To accomplish this, Mr. Maxim has invented a peculiar kind of a gun, which will throw a wooden projectile with any degree of force necessary. The projectile is of hard wood, 4 feet long and 16 inches diameter. The force used is gunpowder of a very coarse and slow grade. The powder chambers are from 2 inches to 6 inches diameter, and may be changed at will. For instance, if a charge of powder filling a breach tube, 3 inches diameter and 4 feet long (ignited at the end nearest the wood), should fail to penetrate a wall or the side of a ship, then a larger tube would be used with more powder, until, by experiment, a blow could be given with precision in the exact spot needed. When the fire is on shipboard, and it becomes necessary to make an opening in the deck, one of the two mammoth picks or hammers may be used. They are drawn up by steam and may be dropped at any height like a pile driver. A hole could thus be made instantly, while the same when only slightly embedded in the deck may be used to make fast and thus pull the ship out into the stream to sink, or to remove it from others which are on fire.

A boat of this kind, aside from a fire boat, would be well calculated for breaking up the ice in the harbor. Her great power and independent wheels would enable her to go anywhere.

Large fires, when within two or three blocks of the river front, could be reached with hose from this boat. It would supply over one hundred lines the same size as used by the steam fire engine, or better, four large lines twenty-five times as large (4 inch or 5 inch nozzles). The discharge pipes would have to be mounted on wheels like a field piece, and would constitute, as it were, the artillery of the fire department. Linen hose can now be made of any size and strength. With proper appliances, hose 8 inches diameter could be readily put down. What is wanted is a stream of water of mammoth proportion, one that will reach 200 or 250 feet, and will have volume sufficient to deluge any building within its reach.

Suppose a boat of this kind should be anchored off the Battery with a lookout, and also connected electrically with the fire alarm system of the three cities. Suppose the boilers all connected and a fire constantly in one of them; the furnaces of the rest carefully charged with cannel coal, as in steam fire engines. One single fire would keep the water in the whole at the steaming point, therefore steam would be always up with a single fire burning. Now, suppose a fire to break out, the lookout sees it, or the alarm is sounded at once, the torch is applied to all the furnaces, steam is turned on to the donkey engine, the anchor comes up, and at the same instant the paddlewheels move; by the time the fire is reached all the furnaces are burning, the steam is up to 80 pounds, and anthracite coal is put on. When the boat stops she turns the steam off her engines and allows it to be used on the pumps.

The cost of a boat of this kind would, it is true, be great, but there has not been a year during the last decade that such a boat would not have paid for herself; and, moreover, the cost of maintenance would be much below proportionately that of steam fire engines, such as are now in use. Many great fires have destroyed millions of property simply because the water pipes were not sufficiently large to supply the water for the engines. There are streets in New York and Brooklyn where, in case of a great fire, the supply of water would not be sufficient to supply the engines. In this respect the boat would have the advantage of an unlimited supply.

We are informed by Mr. Maxim that this boat is the result of a careful investigation of facts and observations, and that he designed it some years ago after witnessing the destruction of some large ships and warehouses by fire.

The fruitless attempts of the puny engine and fire boats to extinguish the fire proved to his mind that something new must be designed to meet the new demand. The result was the system here shown, which we think admirably adapted for the purpose, and which we must eventually adopt.

Any further particulars may be obtained from H. S. Maxim, 120 Broadway, New York.

How Artificial Pearls are Made.

Many persons have no doubt been frequently struck with the great beauty of artificial or imitation pearls. Those who make it their business to produce such articles of ornamenta tion have attained to a high degree of perfection in their art; so much so that in 1862, at the London Exhibition, a Frenchman who was an adept at their manufacture exhibited a row of large real and imitation pearls alternately; and without close inspection, we are assured, it would have been impossible even for a judge to have selected the real from the unreal. Some translations from French and German works on this manufacture have recently been communicated to *Land and Water*, and from these it appears that the art of making imitation pearls is ascribed to one Jacquin, a chaplet and rosary manufacturer at Passy, who lived about 1680. Noticing that the water after cleaning some whitefish (*Leuciscus alburnus*), a species of dace, was of a silvery appearance, he gradually collected the sediment, and with this substance—to which he gave the name of *essence d'orient*—and with a thin glue made of parchment, he lined the glass beads of which he framed his rosaries, and afterward filled them with wax. The method of making the round bead is by heating one end—which has first been closed—of a glass tube, which then, when blown into two or three times, expands into a globular form. The workman then separates the bead, places the end which has been heated on a wire, and heats the other end. This process is called bordering or edging. The best pearls are made in the same way, the holes of the tubes being gradually reduced by heat to the size of those of the real pearls, the workman taking each bead on inserted wire, and, by continually turning them round in the flame of the lamp used, they become so true as to be strung as evenly as the Oriental pearls.

The process of coloring the pearl is commenced by lining the interior of the ball with a delicate layer of perfectly limpid and colorless parchment glue; and before it is quite dry the essence of orient is introduced by means of a slender glass blowpipe. It is then allowed to dry; the pearl is filled with wax, and if intended for a necklace is pierced through the wax with a redhot needle. The essence of orient, as it is called, is the chief ingredient in the manufacture of the pearl. It is a very valuable substance, and is obtained from the fish above named by rubbing them rather roughly in a basin of pure water, so as to remove the scales; the whole is then strained through a linen cloth, and left for several days to settle, when the water is drawn off. The sediment forms the essence referred to. It requires from seventeen to eighteen thousand fish to obtain about a pound of this substance! Besides the French imitation pearls, as those above described are called, there are the Roman pearls, which are made of wax, covered with a kind of pearly luster. But these do not look so well as the French pearls; while, in a heated room, they are apt to soften and stick to the skin. A very extensive trade is now done in the manufacture and sale of French artificial pearls.

Astounding Fungi in Nevada Mines.

A gentleman who recently had occasion to explore the chambers, drifts, and caverns of the old deserted Mexican and Ophir mines, says that fungi of every imaginable kind have taken possession of the old levels. In these old mines, undisturbed for years, is found a fungus world in which are to be seen counterfeits of almost everything seen in our daylight world. Owing to the warmth of the old levels and to the presence in them of a certain amount of moisture, the timbers have been made to grow some curious crops. Some of the fungi in the old chambers are several feet in height, and, being snow white, resemble sheeted ghosts. In places are what at a little distance appear to be white owls, and there are representations of goats with long beards, all as white as though carved in the purest marble. The rank fungus growth has almost closed some of the drifts. The fungi are of almost every imaginable variety. Some kinds hang down from the timbers like great bunches of snow-white hair, and others are great pulpy masses. These last generally rise from the rocks forming the floor of the drifts, and seem to have grown from something dropped or spilled on the ground at the time work was in progress years ago. These growths have in several places raised from the ground rocks weighing from ten to fifty and even one hundred pounds. Some of the rocks have thus been lifted more than three feet.

In the higher levels, where the air is comparatively dry, the fungi are less massive in structure than below and are much firmer in texture. Some resemble ram's horns, as they grow in a spiral or twisted shape, while others, four or five feet in length and about the thickness of a broom handle, hang from the cap timbers like so many snakes suspended by the tails. One kind, after sending out a stem of the thickness of a pencil to the length of a foot or two, appears to blossom; at least produces at the end a bulbous mass that has some resemblance to a flower. In all the infinite variety of these underground fungi it is somewhat strange that not one was seen at all like those growing upon the surface in the light of day. Nothing in the nature of toadstools or mushrooms was found.—*Virginia City (Nev.) Enterprise.*

AGRICULTURAL INVENTIONS.

Messrs. William G. Kennedy, Leonard Z. Preston, Franklin A. Morand, and Edgar H. Kennedy, of Warren, Kansas, have patented a revolving harrow attachment for plows. The invention consists in attaching to the beam of a turn plow a frame in which a skeleton cylinder is set at a slight incline to the line of draught and provided with teeth rearwardly inclined.

Mr. Henry B. Sherwood, of Westport, Conn., has patented a hand cultivator so constructed that the hoes can be adjusted at any desired inclination, will break up the crust or baked soil, and protect small plants from soil moved by the hoes. The hoes, being held down by spring pressure when at work, are prevented from jarring the operator when obstructions are encountered.

Mr. Daniel G. Martz, of Mauzy, Va., has patented a seed drill so constructed that under ordinary circumstances the shovel will be held to its work; but when the shovel meets an obstruction the boot will yield and swing back, and return to its place as soon as the obstruction is passed. The shovel may also be reversed and moved down or up as may be required.

The Eyes of Railway Men.

The annual report of the State Board of Health of Connecticut gives the following statistics relative to the visual power and capacity of the railway men of the State, as determined by the official examiners, Dr. W. T. Bacon and Dr. W. H. Carmalt. Dr. Bacon reports that he examined 326 employes of the New York and New England road; 211 of the New York, New Haven, and Hartford road; 76 of the New London and Northern; 121 of the Norwich and Worcester; 98 of the Connecticut Western; 59 of the Connecticut Valley; 133 of the New York, Providence, and Boston; and 5 of the South Manchester road. Total, 1,029. Of these 160 were engineers, 157 firemen, 100 conductors, 327 brakemen, 90 switchmen, 97 station agents, 98 flagmen, and other signal men. Of the total number 35 were red or green blind, 13 defective in color perception, 78 less than normal vision. Total defective, 120. Dr. Carmalt examined 921 employes on the New York, New Haven, and Shore Line, Housatonic, Naugatuck, Northampton, Air Line, Danbury and Norwalk, Shepaug, New Haven and Derby, and New Canaan railroads. Of the engineers he examined 131, and found 23 with defective vision, and 5 dichromatic (two colors); of the 128 firemen, 6 had defective vision, and 2 dichromatic; of 102 conductors, 14 had defective vision and 3 dichromatic; of 308 brakemen, 38 had defective vision and 13 dichromatic; of 137 switchmen, 22 were defective in vision and 2 were dichromatic; of 115 station agents, 25 were defective in vision and 3 dichromatic.

THE last stone of the masonry of the Brooklyn approach to the East River Bridge was laid February 17. The first eight floor beams of the superstructure were laid the same day. About 400 tons of the 5,000 tons of the steel required in the superstructure have been delivered, or enough to construct about one hundred feet on each side of the Brooklyn tower where the work has been begun. The engineers believe that the superstructure will be completed by next fall, and the bridge opened for travel by January 1, 1882.

The Density of Snow.

According to Sig. G. Bignami Sormani, of Milan, the density of snow, and consequently the weight of it, which roofs, gasholders, etc., may have to carry, varies in a range of as much as eleven times the minimum. A cubic yard of snow from one snowstorm will sometimes weigh 814 pounds, while an equal bulk from another fall will only weigh 71 pounds. This indicates that any flat surface upon which snow may be drifted to the depth of only 3 feet may be called upon to sustain a weight of snow equal to a pressure of about $814 \div 9 = 90{\cdot}5$ pounds per square foot; or it may only be loaded under like conditions to the extent of $71 \div 9 = 7{\cdot}9$ pounds per square foot. The weight of a cubic foot of the densest snow recorded by Sig. Bignami Sormani being 30·14 pounds, while a cubic foot of water weighs 62·5 pounds, it therefore appears that, under certain conditions, the density of snow may be almost half that of water. Snow of this character will, however, in all probability be little different from ice, and would be rarely met with in this country, at least in any serious quantity, except on the ground or very near it. If it were otherwise, it is certain that much more destruction than is at all usual would be the consequence of a thick fall of snow on exposed lofty surfaces. The lowest named weight from new-fallen snow, only 2·68 pounds per cubic foot, is abnormally light, being only about one twenty-fourth of the density of water. It is usually assumed that the density of snow is ordinarily about one-eighth that of water, and this allowance, therefore, falls well within the range of Sig. Bignami Sormani's figures.

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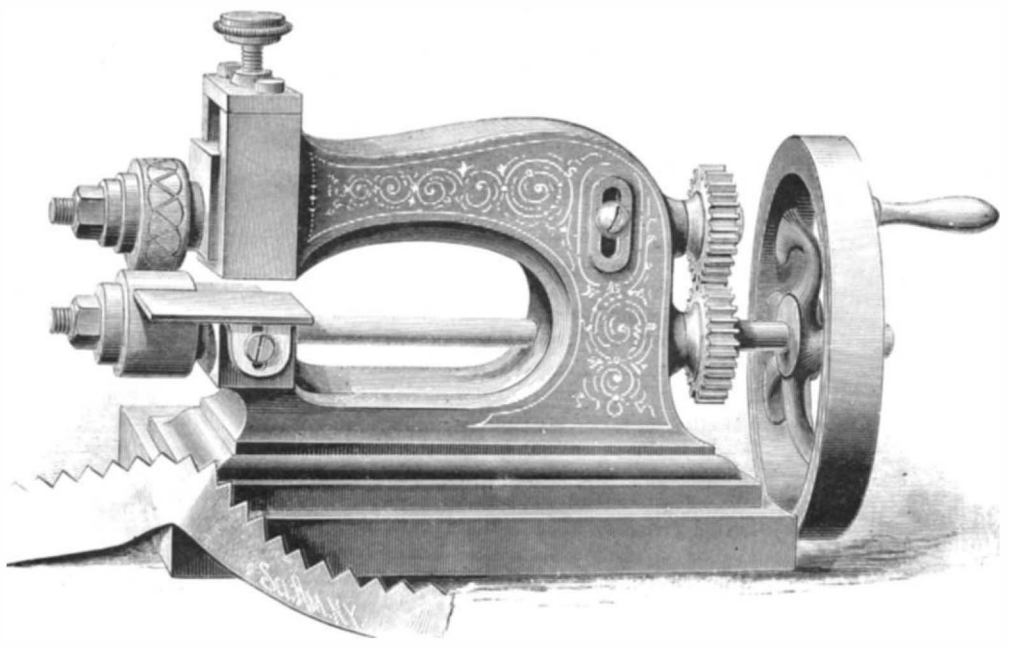
PINKING MACHINE.

The annexed engraving represents a simple machine for pinking the edges of cloth, silk, velvet, leather, etc., and is designed to replace the punch used at present. The invention consists essentially of two rollers, one of which has the design in relief, the other having it cut in, the two rollers being in contact. They are made of hardened steel, and are mounted on parallel shafts, one of which is provided with a hand wheel for rotating it. The other shaft is rotated by means of a pair of gear wheels mounted on the shafts. The upper shaft can be raised or lowered according to the thickness of the material by means of an adjusting screw.

The relief of the pattern roller is not sharp, and does not really cut the fibers, but crushes them. As the various pattern rolls are not of the same diameter, the upper shaft is made adjustable in height, and can be locked in any position by means of a screw passing through the side of the frame. This machine is the invention of H. Schmidt, Berlin.—*Deutsche Industrie Zeitung.*



PINKING MACHINE.

New Use for Sawdust.

The *Lumberman* says: We have been shown a model of a car wheel consisting of an iron rim of seven inches outward diameter by one-half inch thick, fitted with a well proportioned hub, the space between the hub and rim filled with pine sawdust, pressed in so solidly that we are ready to believe the assertion that resting the iron rim upon bearings, a pressure equal to 23 tons applied to the hub failed to develop any signs of weakness. We hesitate in these days of progress to assert that anything is impossible, and we begin to think that even sawdust possesses elements of value hitherto unsuspected, and that the day may come when the filled grounds adjacent to all sawmills may be seen to have a great value in the mechanical development and utilization of the now useless *débris* placed upon them to get it out of the way. Sawdust car wheels, sawdust brick, sawdust fence posts, railroad ties, and even sawdust window and door frames, wainscoting and mouldings, begin to appear among the possibilities of the immediate future.

AMATEUR MECHANICS.

WOOD-WORKING.

It is not the intention of the writer to enter largely into the subject of wood-working, but simply to suggest a few handy attachments to the foot lathe which will greatly facilitate the operations of the amateur wood-worker and will be found very useful by almost any one working in wood. It is not an easy matter to split even thin lumber into strips of uniform width by means of a handsaw, but by using the circular saw attachment, shown in Fig. 1, the operation becomes rapid and easy, and the stuff may be sawed or slit at any desired angle or bevel. The attachment consists of a saw mandrel of the usual form, and a wooden table supported by a right angled piece, A, of round iron fitted to the tool post and clamped by a wooden cleat, B, which is secured to the under side of the table, split from the aperture to one end, and provided with a thumb-screw for drawing the parts together. By means of this arrangement the table may be inclined to a limited angle in either direction, the slot through which the saw projects being enlarged below to admit of this adjustment.

The back of the table is steadied by a screw which rests upon the back end of the tool rest support, and enters a block attached to the under side of the table. The gauge at the top of the table is used in slitting and for other purposes which will be presently mentioned, and it is adjusted by aid of lines made across the table parallel with the saw.

For the purpose of cross-cutting or cutting on a bevel a thin sliding table is fitted to slide upon the main table, and is provided with a gauge which is capable of being adjusted at any desired angle. For cutting slots for panels, etc., thick saws may be used, or the saw may be made to wabble by placing it between two beveled washers, as shown in Fig. 2.

The saw table has an inserted portion, C, held in place by two screws, which may be removed when it is desired to use the saw mandrel for carrying a sticker head for planing small strips of moulding or reeding. The head for holding the moulding knives is best made of good tough brass or steam metal. The knives can be made of good saw steel about one-eighth inch thick. They may be filed into shape and afterward tempered. They are slotted and held to their places on the head by means of quarter-inch machine screws. It is not absolutely necessary to use two knives, but when only one is employed a counterbalance should be fastened to the head in place of the other. All kinds of moulding, beading, tonguing, and grooving may be done with this attachment, the gauge being used to guide the edge of the stuff. If the boards are too thin to support themselves against the action of the knives they must be backed up by a thick strip of wood planed true. The speed for this cutter head should be as great as possible.

Fig. 5 shows an attachment to be used in connection with the cutter head and saw table for cutting straight, spiral, or irregular flutes on turned work. It consists of a bar, D, carrying a central fixed arm, and at either end an adjustable arm, the purpose of the latter being to adapt the device to work of different lengths. The arm projecting from the center of the bar, D, supports an arbor having at one end a socket for receiving the twisted iron bar, E, and at the other end a center and a short finger or pin. A metal disk having three spurs, a central aperture, and a series of holes equally distant from the center and from each other, is attached by its spurs to the end of the cylinder to be fluted, and the center of the arbor in the arm, D, enters the central hole in the disk while its finger enters one of the other holes. The opposite end of the cylinder is supported by a center screw. A fork attached to the back of the table embraces the twisted iron, E, so that as the wooden cylinder is moved diagonally over the cutter it is slowly rotated, making a spiral cut. After the first cut is made the finger of the arbor is removed from the disk and placed in an adjoining hole, when the second cut is made, and so on.

Figs. 6 and 7 show a convenient and easily made attachment for moulding the edges of irregular work, such as brackets, frames, parts of patterns, etc. It consists of a brass frame, F, supporting a small mandrel turning at the top in a conical bearing in the frame, and at the bottom upon a conical screw. A very small grooved pulley is fastened to the mandrel and surrounded by a rubber ring which bears against the face plate of the lathe, as shown in the engraving. The frame, F, is let into a wooden table supported by an iron rod which is received by the tool rest holder of the lathe. The cutter, G, is made by turning upon a piece of steel the reverse of the required moulding, and slotting it transversely to form cutting edges. The shank of the cutter is fitted to a hole in the mandrel and secured in place by a small set screw. The edge of the work is permitted to bear against the shank of the cutter. Should the face plate of the lathe be too small to give the required speed, a wooden disk may be attached to it by means of screws and turned off.

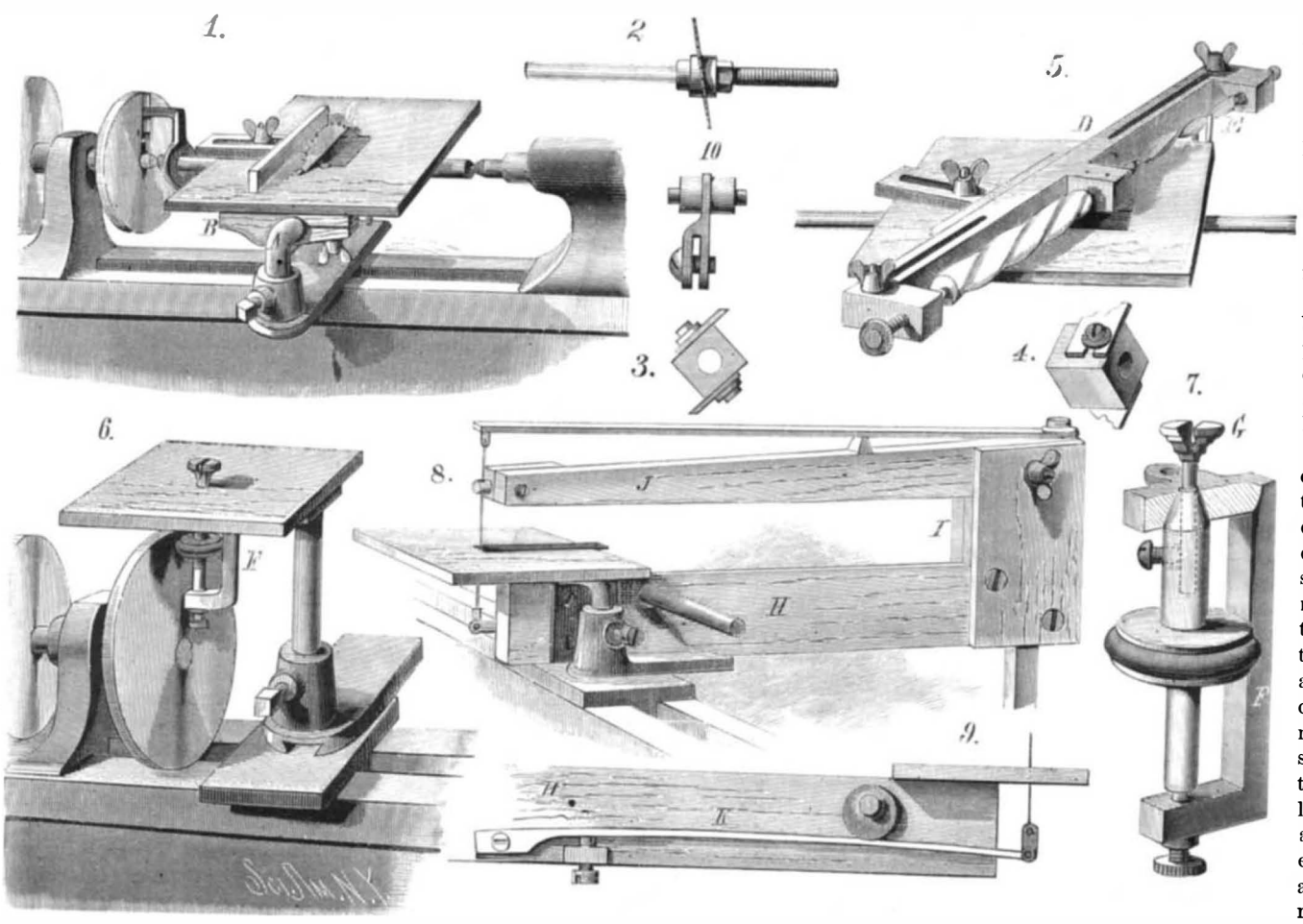
Figs. 8, 9, and 10 represent a cheaply and easily made scroll saw attachment for the foot lathe. It is made entirely of wood and is practically noiseless. The board, H, supports two uprights, I, between which is pivoted the arm, J, whose under side is parallel with the edge of the board. A block is placed between the uprights, I, to limit the downward movement of the arm, and the arm is clamped by a bolt which passes through it and through the two uprights and is provided with a wing nut.

A wooden table, secured to the upper edge of the board, H, is perforated to allow the saw to pass through, and is provided with an inserted hardwood strip which supports the back of the saw, and which may be moved forward from time to time and cut off as it becomes worn. The upper guide of the saw consists of a round piece of hard wood inserted in a hole bored in the end of the arm, J. The upper end of the saw is secured in a small steel clamp pivoted in a slot in the end of a wooden spring secured to the top of the arm, J, and the lower end of the saw is secured in a similar clamp pivoted to the end of the wooden spring, K. Fig. 10 is an enlarged view showing the construction of clamp.

The relation of the spring, K, to the board, H, and to the other part is shown in Fig. 9. It is attached to the side of the board and is pressed upward by an adjusting screw near its fixed end.

The saw is driven by a wooden eccentric placed on the saw mandrel shown in Figs. 1 and 2, and the spring, K, always pressed upward against the eccentric by its own elasticity, and it is also drawn in an upward direction by the upper spring. This arrangement insures a continuous contact between the spring, K, and the eccentric, and consequently avoids noise. The friction surfaces of the eccentric and spring may be lubricated with tallow and plumbago. The eccentric may, with advantage, be made of metal.

The tension of the upper spring may be



WOOD-WORKING ATTACHMENTS FOR THE FOOT LATHE.

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varied by putting under it blocks of different heights, or the screw which holds the back end may be used for this purpose.

The saw is attached to the lathe by means of an iron bent twice at right angles, attached to the board, H, and fitted to the tool rest support. The rear end of the sawing apparatus may be supported by a brace running to the lower part of the lathe or to the floor.

The simple attachments above described will enable the possessor to make many small articles of furniture which he would not undertake without them, and for making models of small patterns they are almost invaluable.

M.

THE OSPREY.*

One of the most interesting of the predaceous birds which belong to Great Britain is the celebrated osprey or fishing hawk. This fine bird was formerly very common in England, but is now but rarely seen within the confines of the British Isles, although isolated species are now and then seen.

As the bird is a fish-eater, it is generally observed on the sea coast or on the banks of some large river, but has occasionally been observed in some comparatively waterless situation, where it has probably been driven by stress of weather. In some parts of Scotland the osprey still holds its own, and breeds year after year on the same spot, generally choosing the summit of an old ruined building or the top of a large tree for that purpose. The nest is a very large one, composed almost wholly of sticks, and contains two or three whitish eggs, largely blotched with reddish-brown, the dark patches being collected toward the large end of the egg. As in the case with the eagles, the osprey is monogamous; but on the death of either of the pair, the survivor soon finds another mate, and is straightway consoled by a new alliance. From all accounts it is an affectionate and domestic bird, paying the greatest attention to its mate and home, and displaying a constancy which is not to be surpassed by that of the turtle-dove, so celebrated for matrimonial felicity.

The flight of the osprey is peculiarly easy and elegant, as might be expected from a bird the length of whose body is only twenty-two inches, and the expanse of wing nearly five feet and a half. Living almost wholly on fish, the osprey sails in wide undulating circles, hovering over the water and intently watching for its prey. No sooner does a fish come into view than the osprey shoots through the air like a meteor, descends upon the luckless fish with such force that it drives a shower of spray in every direction, and soon emerging, flies away to its nest, bearing its prey in its grasp. In order to enable it to seize and retain so slippery a creature as a fish, the claws of the osprey are long, curved, and very sharp, the soles of the feet are rough, and the outer toe is capable of great versatility. When the bird has settled upon its nest, or upon any spot where it intends to eat its prey, it does not relinquish its hold, but, as if fearful that the fish should escape, continues its grasp, and daintily picks away the flesh from between its toes. Sometimes in making its swoop it arrests itself for a second or two, as if to watch some change of position on the part of its intended prey.

The singular beauty of the osprey's flight attracted the attention of M. de Quatrefages, who remarked that the bird was able with outstretched and immovable wings, not only to withstand the power of a "squall" that would have flung a man to the ground, but even to work its way against the wind. How this feat was performed he confesses to be a mystery to him, and that the so-called scientific theories of "acquired velocity" or "tremulous movement" of the wings could not at all account for the phenomenon which he observed.

Harmless though the osprey be—except to the fish—it is a most persecuted bird, being not only annoyed by rooks and crows, but robbed by the more powerful white-headed eagle, who strikes the osprey on the wing and snatches from the poor bird the results of its morning's labors.

*For our beautiful cut of the osprey we are indebted to "Brehm's Animal Life." We extract the description from "Wood's Natural History."

There is but one species of osprey, although it has been thought that the American bird ought to be reckoned as a different species. The general color of the osprey is dark brown, but it is pleasingly variegated with various shades of black, gray, and white. The crown of the head and the nape of the neck are covered with long gray-white feathers, streaked with dark brown. The under surface of the body is white, with the exception of a light brown band which extends across the chest. The primaries are brown tipped with black, and the tail is barred above with a light and a deep brown, and below with brown and white. The legs, toes, and cere are blue, the eyes golden yellow, and the beak and claws black.

THE OSPREY.—(*Pandio haliætus.*)

A Wasp Attacks a Spider.

Mr. Seth Green, writing to the New York *World*, says that one morning when he was watching a spider's nest a wasp alighted within an inch or two of the nest, on the side opposite the opening. Creeping noiselessly round toward the entrance of the nest the wasp stopped a little short of it and for a moment remained perfectly quiet; then reaching out one of his antennæ he wiggled it before the opening and withdrew it. This overture had the desired effect, for the boss of the nest, as large a spider as one ordinarily sees, came out to see what was wrong and to set it to rights. No sooner had the spider emerged to that point at which he was at the worst disadvantage, than the wasp with a quik movement thrust his sting into the body of his foe, killing him easily and almost instantly. The experiment was related on the part of the wasp, and when there was no resport from the inside he became satisfied probably that he held is fort. At all events he proceeded to enter the nest and slahter the young spiders, which he afterward carried off the at a time.

IMPROVED FERTILIZER.—In Biedermann's C. Bl. lr. W. Pochin describes a new fertilizer obtained from sls produced by dephosphorizing iron with lime. The sls are powdered, are treated with muriatic acid for remove part of the iron and lime, and are finally transformed into perphosphates by means of sulphuric acid.

Peculiar Reddening of Salted Codfish.

During the hot and damp weather of summer a peculiar redness often makes its appearance on salted codfish, rendering them unfit for the market and causing them to putrefy comparatively quickly. The loss suffered by dealers from this cause during some years is considerable. Prof. W. G. Farlow, of Harvard University, having been requested to investigate the matter, has rendered a report, which appears as an appendix to the recently issued report of the U. S. Fish Commission for 1878.

Prof. Farlow finds, on microscopic examination, that the redness is due to a minute alga known to botanists as *Clathrocystis roseo-persicina*. The plant consists simply of very minute cells filled with red coloring matter and embedded in a mass of slime. Its development has been studied by several botanists, who agree in considering it closely allied to *C. æruginosa*, a common species growing in fresh-water ponds, and which has lately come into public notice in consequence of the so-called "pig-pen" odor which it exhales when decaying. The species found on the codfish is also known in dissecting-rooms, where it grows in tubs in which bones are macerating. Wherever found it does not flourish nor increase very rapidly at a temperature below 65° F. Although the plant may be introduced into the fish-packing houses from the marshes in the vicinity of Gloucester, Prof. Farlow is inclined to believe that its origin is to be looked for from another source. The two kinds of salt most used by the fishermen of Gloucester are the Cadiz and Trepani. The former has a rosy tinge, while the latter is pure white. An examination with the microscope revealed the fact that the rosy color of the Cadiz salt was due to the presence of considerable quantities of precisely the same minute plant which is found in the red fish. What must happen then is plain. When the latter salt is sprinkled in large quantites upon the fish as they are packed in the hold of the vessel, the plants, if the weather is sufficiently warm, begin their growth, and the fish are soon affected during the voyage. As a preventive of the evil, Prof. Farlow recommends that every part of the woodwork of the packing houses be painted, so it may frequently be washed clean and the lodgment of the plant be prevented. He also suggests that Trepani salt be used instead of Cadiz in curing the fish, although the cost may be greater.

Descent of Man.

Two French savants have for the last twelve months been keeping nine pigs in a state of habitual drunkenness, with a view to testing the effects of different kinds of alcoholic liquors; the Prefect of the Seine having kindly put some sties in the yard of the municipal slaughter-houses at the disposal of the savants, in order that they might conduct their interesting experiment at the smallest cost to themselves. Pigs were chosen for the experiment because of the close resemblance of their digestive apparatus to that of man. The pig who takes absinthe is first gay, then excitable, irritable, combative, and finally drowsy; the pig who has brandy mixed with his food is cheerful all through till he falls to sleep; the rum swilling pig becomes sad and somnolent almost at once; while the pig who takes gin conducts himself in eccentric ways; grunting, squealing, tilting his head against the sty door, and rising on his hind legs as if to sniff the wind. Dr. Decaisne, describing these experiments with intoxicated swine, remarks in the *France* that they are none the worse for their year's tippling.

These experiments, taken in conjunction with the pig's well known personal peculiarities in feeding and his obstinate refusal to travel the correct path, go far to show that man was evolved from the hog rather than from the monkey, as some have surmised.

FOREIGN COMMERCE TO THE UNITED STATES.—The Secretary of the Treasury reports that the value of merchandise exported from the United States for the single month of December, 1880, was ninety-eight million eight hundred and fifty-six thousand six hundred and thirty-two dollars ($98,856,632), being the largest monthly export ever made in the history of the country. The total exports for the year 1880 were $889,649,840. Imports during same period, $696,803,433.

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RECENT INVENTIONS.

Mr. Robert Hutton, of Holyoke, Mass., has patented a tension regulator for paper drying and other machines, such as printing presses, wall paper, printing machines, calico calendering machines, cloth-stretching machines, etc., whereby the tension on the material is kept uniform. The invention consists in a loose driving pulley, having its hub formed with inclines, and loose collars drawn to the hub by springs, combined with a winding shaft having fixed collars pressed to the loose collars by a screw, whereby the shaft is turned by the pulley, the friction being equalized by the equalization of the strain between the springs and the material being wound.

Mr. George W. Kaufman, of London, Ohio, has patented an improved wrench for use in screwing on or off the nuts of bolts in carriage wheels. The invention consists in a frame carrying a socketed shaft for receiving the wrench head, and a second shaft formed to receive a brace or crank, the shafts being connected by gearing, and the frame fitted with clamps for its attachment to the wheel.

Mr. Robert A. Bendall, of Cohoes, N. Y., has patented a machine for making three-ply roofing felt, which operates to insert a layer of plastic slate between two layers of paper, pressing the three-plies or thicknesses into a compact felt, and winding the felt into a roll. The material so prepared can be laid upon a roof, all that is necessary to finish the work being an exterior coating or layer of plastic slate.

Mr. John Butler, of New York city, has patented an electro-magnetic apparatus for medical use. The apparatus has one or both electrodes fitted as a roller or rollers for use in the manipulation of the muscles, so that magnetic and mechanical treatment can be combined in a single operation. The roller is hung on the permanent magnet and geared to give revolution. The armature and the permanent magnet serve as a handle by which the apparatus can be operated.

Mr. Jacob Pluess, of Prairie du Sac, Wis., has patented an improved boot and shoe constructed to prevent its running over to one side, and to prevent the ripping of seams caused by bending the boot or shoe at the shank. The boot or shoe is provided with a strengthening strip of leather interposed between the outer edge portion of the inner sole and the upper, which overlaps the stiffening strip, and is fastened to the inner sole, thereby forming a support for the heel ball and shank portions.

Mr. Robert K. Slaughter, of New York city, has patented an improvement in window shades which is designed to secure all the useful effects of opaque shades with the advantages of semi-transparent shades. He combines the two classes of materials, inserting the semi-transparent material into the opaque, and ornamenting the semi-transparent material, whereby the ornamentation is visible whether the room be exteriorly or interiorly illuminated, and also securing both cheapness and artistic effect.

A Simple Photophone.

The photophone has been reproduced in an exceedingly simple form by Mr. Shelford Bidwell. The transmitter is a disk of thin microscopic glass silvered on its anterior surface, and placed in front of a tube by which the voice is conveyed to it so as to excite vibration. The lime, or electric light, is reflected from this mirror through a convex lens, so as to render the rays parallel; these being received on a second lens at some distance, and again concentrated on a selenium receiver. This is the most important part of the apparatus. It consists of a slip of mica, two and a quarter inches long and three-quarters inch broad, round which is wound No. 40 copper wire in the form of a flat screw, with a pitch of one-sixteenth of an inch. The ends are fixed through holes drilled in the mica. A second wire is then wound beside but not touching the first. A few grains of vitreous selenium are melted and dropped on the surface of the mica, being afterward evenly spread by means of another slip of mica. The temperature should be just above the fusing point of selenium. It is then allowed to cool. It is next annealed for several hours and allowed to cool very slowly. The terminals of this cell are joined up with a battery of eleven Leclanché elements and a pair of Bell telephones wound with finer wire than usual, in larger quantity than that required for ordinary telephonic communication. The voice is very fairly conveyed across a space of ten feet and into a neighboring room by this simple form of apparatus.

The Evening Sky.

The Providence *Journal*, in a recent issue, says: The planetary aspect of the evening sky has not been so beautiful for many years, and the show is now approaching its culmination. The heavens were glorious to behold during the evenings of the last week. The moon, commencing with the 2d, paid her respects on successive evenings to Venus, Jupiter, and Mars, and, excepting on one evening, there were no clouds to mar the exceptional beauty of the scene. No observers could lift their eyes to the golden mysteries enshrined above without being impressed with the exceeding loveliness of the shining throng. Sunday evening, however, carried off the palm for the remarkable clearness of the sky, the purity of the atmosphere, and the unruffled serenity of the elemental conditions. The night was one dear to the heart of astronomers. At 6:30 the celestial arch presented a charming picture, the trio of planets glowing in the west; the moon, one day past the first quarter, shining from the zenith with the clustering Pleiades not far away, Orion with his glittering brilliants filling the eastern sky with sparkling light, and the matchless Sirius shining in the southeast. The telescopic view of separate portions of the picture was superb beyond expression. Venus, when the far-seeing eye of the instrument was turned upon her, was an object of dazzling brightness, nearly the size of the moon, her disk half enlightened, as our luminary looks at her last quarter. Jupiter was splendidly brilliant, his belts radiant in prismatic hues, his great red spot visible, and his moons attending their giant chief, two on one side and two on the other. Saturn's peerless ringed orb, with his belts and three moons, was the next study. The telescope was then turned to the moon, a portion of the terminator or boundary between the bright and shaded portions being brought into the field. With a high power she seemed so near that one by reaching out might almost touch her surface. There is nothing in astronomy more impressive than the utter desolation and death that reign on the chalk-like surface of this dead planet. There are no clouds to diversify the sky, no twilight to prolong the day, no sound to break the eternal silence. Immense craters, deep fissures, rounded hillocks, and the scars of mighty commotions, are all that remain of regions that were probably habitable like the earth in times gone by. The view on the terminator was the most interesting. Instead of the unbroken line of light that marks its appearance to the naked eye, the moon's rough edge was formed of branching horns of radiant light, like the antlers of a stag or huge formations of coral. These were the summits of lunar mountains, lighted up by the sun, which was just rising to this part of the moon. The bright mountain peaks were weird and wonderful, as well as beautiful, though their only admirers were observers 240,000 miles away.

A Sacrifice in a Study.

Commenting on the recent death and attributes of Dr. Edward Washburn, one of New York's most distinguished scholars and able divines, the Philadelphia *Ledger* thus alludes to the probable cause of his death:

In the midst of his studies for the help of humanity—in his study room itself, it is said, was the poisonous malaria that struck down the scholar and the student of human problems. His wasting disease of many weeks' duration is set down to malaria from imperfect sewerage under the room in which he spent many hours of work daily. It seems like a grim satire on human limitations that, while the saving sciences and humanity were his especial study, the neglect, the ignorance, or the gross stupidity of housebuilders was preparing a poison which sent him to the grave. Here, then, in the midst of the knowledge and cultivation and wealth of New York, were conditions, it seems, equal in effect to that of any squalid tenement house or fever-plagued town in the East, where Dr. Washburn traveled years ago. There was the subtle poison in the very atmosphere when this active organizer was planning to purify the plague places of the city. Whatever there was of latent weakness or constitutional defect, this wretched sewer stuff acts promptly or slowly, but always surely to bring out, and strike down with it just as surely the scientist as the simple little child. How many other students, it might the well to ask, are burning the midnight oil or spending the daylight over dark and hidden poison traps? How many sermons are written, or legal arguments laid out, or scientific discoveries worked out, or even disease studied out, in the midst of surroundings that are sarcastic enough commenters upon the ignorance of all these workers and scholars and scientific inquirers? When a man's foes are those of his own household, in pipe and drain, it is time to begin to look at home. In these days "black care" does not ride behind the successful man, but black death may sit behind the desk or lie in wait in the wainscoting to confound a wealth and knowledge with the problem of the sewer.

New Remedy for Pruritus.

Physicians are often sorely puzzled to give relief to the symptom of itching which so frequently forms a prominent feature in certain skin diseases, and the most varied local measures are often used with the result of aggravating the local irritation. The list of internal remedies used for allaying this distressing condition is a limited one, and from it chloral and bromide of potassium stand out almost alone; but the objections to the continued use of these are too obvious to require mention. In searching for a vegetable neurotic which would probably have the desired effect, Dr. L. D. Bulkley says, in the New York *Medical Journal*, that he concluded that gelsemium, from the relief that it affords in certain cases of neuralgia, etc., might possibly act as a nervous sedative to the skin. This, on experiment, turned out to be true, and now after prescribing it with considerable success for two or three years, mainly on adults suffering from eczema, he feels prepared to advise it as an adjuvant for the relief of itching in certain cases. He has used the tincture of the drug only, giving it in ten drop doses to begin with, and, when no relief was obtained, repeating the remedy in twelve or fifteen drop doses at intervals of half an hour, until results were obtained or until a drachm or so had been taken in two hours.

Paper and Paper Pulp from Salt Hay.

It has probably not been generally known among paper-makers remarks the *Paper World*, that the grass ordinarily grows upon the low, marshy lands bordering upon salt water and frequently overflowed by it, furnishes a most excellent material for paper. This grass grows in great plenty, and can be had for a comparatively low price, and contains nearly as much useful fiber to a ton as straw. It is very easily digested, and can be reduced in a very short time, two hours being quite sufficient. The brown pulp as discharged from the digester makes a very superior quality of hardware paper, and a trifling expense only is incurred in bringing the brown pulp up to a manila color, and even a fair quality of white paper may be produced from it. This stock when made into paper board produces an article of superior strength and rigidity, and one not liable to fracture in bending. The yield of useful pulp from a ton of hay is about nine hundred pounds, and the cost for caustic, we learn from the same authority, is very moderate.

The Contagiousness of Glanders.

Glanders is now so prevalent throughout the country, and exists to such an alarming extent in London, that any additional evidence we can obtain as to the manner in which it is propagated must be of value. It is not, perhaps, going beyond the mark to assert that not one-half of the cases of this horrible and fatal disorder are reported to the government; nor is it the less true that proper sanitary measures are very seldom adopted for its suppression. And it is greatly to be feared that the malady is mistaken for other diseased conditions, especially pyæmia, and that sick animals are allowed to live for weeks or months among others, to the great danger of not only these, but their human attendants. It has long been known that glanders is an inoculable disease, and that it could also be produced by transfusing blood from a diseased to a healthy horse or ass, as well as by introducing the virus contained in the nasal discharge into the stomach. It is possible that all the secretions and excretions are more or less infective, the peculiar muco-purulent fluid thrown off by the Schneiderian membrane probably being most active. This discharge has been blamed as rendering the public watering troughs a source of danger, the fluid passing into the water when glandered horses are allowed to quench their thirst at these valuable conveniences. It has been objected to this notion, that the discharge, being heavier than water, falls to the bottom of the trough, and, not being readily diffusible, is not likely to be swallowed by other horses watered there. This argument had a certain amount of plausibility, and the friends of the public water trough movement availed themselves of it when the troughs were accused of being largely instrumental in disseminating the disease.

From a note presented to the Académie des Sciences by Professor Galtier, of the Lyons Veterinary School, it appears that he has been successful in transmitting the disease to an ass, by the hypodermic injection of saliva from a glandered horse. We know that the virulent germs find admission not only through a wound or abrasion, or a thin mucous membrane, such as the conjunctiva, but also by the digestive organs. Saliva readily mixes with water, and those who have watched horses drinking will have remarked that some of the water taken into the mouth escapes by the commissures of the lips and falls back into the trough or bucket; and when drinking has been completed, a certain quantity which has not been swallowed is also returned; so that a glandered horse may largely contaminate the water in a trough with his saliva. Not only this, but when horses drink greedily, it often happens that a portion of the water is returned through the nostrils; so that the nasal, as well as the salivary secretion, may find its way into the mass of water which healthy horses subsequently swallow.

Galtier's experiments also go to show that the glander virus loses its activity when the matters which contain it, whether liquids or tissues, have been completely desiccated for fifteen days. Thorough ventilation of buildings which have been tenanted by glandered horses is, therefore, a very effective means of purifying them.

The diagnosis of glanders is sometimes very difficult, if not impossible, without having recourse to test inoculation; and the animal usually inoculated is the ass, that creature being not only less costly for this purpose, but also more easily infected than the equine species. It is still costly, however, and being large and somewhat expensive to keep during the experiment, other more convenient animals have been proposed for substitution. The rabbit is one of these, but, as M. Colin has shown in the experiments which we described a fortnight ago, it cannot be relied upon as a test animal.—*Lancet.*

Corn Stalk Sugar.

At a recent meeting of the American Agricultural Association in this city, Dr. Peter Collier, chemist of the Department of Agriculture at Washington, stated that during the past year there have been examinations made of 38 varieties of sorghum grown in and received from 14 different States, and from 9 varieties of Indian corn. The results of analyses made, 1,318 in all of the sorghums, showed them to yield, on an average, 1,662 pounds of available sugar. From 4 of these varieties the sugar was extracted in quantity and at a rate of fully 2,000 pounds per acre. As to the corn stalks the results were most satisfactory, but the experiments were not so numerous as with sorghum. An average of 26 analyses of the 9 varieties examined showed them to contain in their juice an amount of sugar greater in quantity than the average of the best 30 specimens of the 60 specimens of sugar beets grown in different parts of the country. After a large crop of ripe corn had been gathered, the stalks yielded at the rate of over 900 pounds of sugar to the acre, and there appears no reason to doubt that this result could be obtained upon a large scale.

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A DUCKING BATTERY AND HOW TO MAKE IT.

This ingenious device, employed by the duck shooters of Chesapeake Bay, is well shown in use by the accompanying engraving, while below we show a sectional view of a battery drawn to a scale, which will prove of assistance to those of our readers who would like to make and try this method of circumventing the ducks which swarm in some sections of this country.

The battery is so constructed that when loaded with the guns and ammunition of the shooter, with a proper amount of iron for ballast that the water is on a level with the deck of the box, the shooter lying on his back is entirely concealed from view; in fact, when well ballasted and surrounded by the decoys it is impossible to distinguish this strange boat even at a short distance. The gunner remains on his back till the ducks are well over his decoys, when he rises to a sitting position and gives them a volley with his first gun, and, picking up his second, is ready to kill any cripples before they can dive and escape. With beginners it is difficult to judge distances across the water, and ducks will look much nearer to the box than they really are. If a large flock comes to the decoys, by permitting the first arrivals to light before sitting up in the box, and shooting at those first which have not settled, a person will frequently have an opportunity of doing execution to the first comers with his second gun before they get out of range; but under no circumstances should the shooter attempt to rise before the ducks drop their legs as though in the act of settling.

A battery should be accompanied by a small sail-boat, whose duty it is to pick up the dead birds as they drift to leeward, and to stir up and keep moving any flocks which may alight in the vicinity.

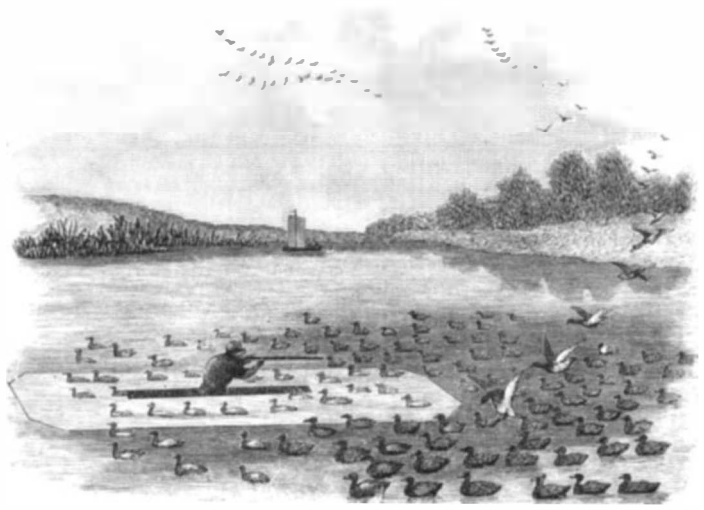
Fig. 2 shows a skeleton view of a battery: A, box in which the shooter lies; B, rim of sheet lead tacked down on inner edge so as to turn up in rough weather to prevent the water washing over; C C, an outer strip of lead; D D is the deck supported by beams, which should be of oak one and a half inches thick, five inches wide in the center, and reduced at the ends to half an inch, and well secured by bolts; E shows canvas sheeting or gunny bagging tacked on light wooden frame; F is a board attached to G, which is a similar board secured to the deck by strong iron hinges; H shows leather hinges securing frames to the deck; I I represents hinges so made as to allow the end wing to fold over the side wings, which should be first drawn upon the deck when the battery is to be moved from its position; K shows ropes running from the frame ends, to which the canvas is attached, permitting the wings to be folded more readily; L L, points at which ropes pass through the frame, supporting deck to middle or bight, to which the head anchor is attached; M is the point at which the foot anchor is attached by a knot, the rope running through a hole made through the deck and a supporting beam or frame.

Use one inch pine for construction, except for head or foot board of box, which should be of oak or some more lasting wood and two inches thick. The bottom and side boards of the box are attached to the head and foot, so to a great extent the strength of the entire box depends on them. For use by a person of ordinary size a battery of the following dimensions will answer: Length of box, 6 feet 3 inches; depth of box, 1 foot 1½ inches; width of box at bottom, 1 foot 8 inches; width of box at top, 2 feet; length of deck, 12 feet; width of deck, 7 feet; width of lead rims, 4 inches; width of frames for canvas, 2 feet; width of boards, F and G, each, 8 inches; width of canvas at head, 9 inches.

The deck declines off on each side about an inch and prevents much wash, which would occur if it was made on a dead level. The edge of the box should be a quarter of an inch above level of the deck. The rim of sheet lead can be turned up in launching the battery, or when there is much ripple it prevents water from getting into the box. The outside rim only extends around the head, which is always anchored to the breeze, and consequently gets more the force of the waves, which are broken in their shock by the boards, F G, at the head.

It is of great importance that the battery should be anchored properly to insure comfort to the shooter. The head of the platform, by fastening the anchor rope, L L, as described, is in a measure free from restraint, which permits it to rise and fall with the swell in an easy manner, and prevents the waves from breaking over into the box, which would be the result if anchored to the extreme end of the platform. The foot anchor rope, by running through a hole and fastened by a knot, can be reached and pulled up by the shooter in case a sudden change of wind makes it necessary to let it shift its position. A false bottom or drain board takes up about an inch of the depth and adds to the comfort. An old robe to lie upon, a couple of guns stowed away, cartridge box between his feet, and the shooter is ready for action.

The amount of ballast necessary depends on the weather, size of the person, etc. Pieces of railway iron are good, and eight or ten decoys made of cast iron and properly painted will be found handy to use for ballast by placing on the deck around the box, and can be shifted in case of change of wind. The deck and canvas should be painted a sedge color. The boat or tender which assists in setting the battery and picking up the birds should always keep in sight, ready to come to assistance of the shooter if necessary.

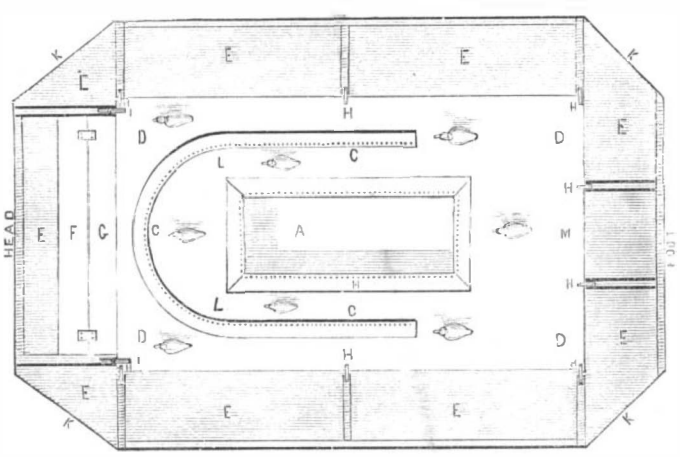


BATTERY OR SINK BOX.

A Scientific Railway Car.

There arrived at our depot, yesterday afternoon, a passenger car the like of which is not to be found anywhere in the world. It is the property of Mr. P. H. Dudley, inspector of the tracks and apparatus of railroads, and this gentleman and his wife live in this car. A reporter of the *Sun* called on the occupants yesterday afternoon, and was entertained for nearly an hour with the explanations of and experiments made with the large piece of machinery by which the gentleman accomplishes his work. It is of the most complicated and delicate nature, and the amount of work done by it is marvelous. A description of it would be wearisome, with its systems of cogs, switches, wires, pens, etc., etc., and would be almost unintelligible, but an idea of its extraordinary work may be gained from the following summary of its accomplishments:

A band of plain paper, about twenty inches wide, is fed from a roll into the machine, passing under a complex set of everflowing pens. For every fifty feet of track passed over by the car this paper band moves one inch, thereby taking eight and a fraction feet for a mile of road. By carefully constructed and adjusted machinery, connected with the wheels of the car, the operator obtains upon the paper a perfect chart of every foot, yes, every inch, of the road. The instrument shows: first, the power required to draw the train; second, a pen marks on the paper the seconds of time in transit; third, another pen marks every tenth second in the same way; fourth, still another pen marks each minute. Then comes a schedule showing the distribution of coal used by the engine; the amount of water used by the engine; a perfect diagram of the track is delineated, showing all curves, grades, etc.; the number or revolutions which the driving wheels of the engine mare in a minute or mile, or parts of these two; the location of the mile posts are shown, as also the bridges; the work done by the engine, so given that the foot-pounds of work can be readily ascertained by multiplying the ratios; the velocity and resistance of the wind. All these are plainly and accurately shown upon the diagram. When used to inspect the track, the machine shows the surface of each rail, giving the condition of each joint, frog, etc., and shows at a glance whether the rails are fitted perfectly true, or the least trifle out of place, or if one is a hair's breadth higher than another. The elevation of the rail on a curve is shown, and a machine has just been added, which Mr. Dudley invented, giving the exact amount in feet and inches that the rails are depressed from a true line. Another section of the chart gives the exact movements of the engineer when the brakes are applied, when steam is put on, and the power required to start and stop the train. Mr. Dudley examines a road in this way, hands his chart to the superintendent, and that gentleman knows at once just where to make repairs and all other needful particulars. The machine is the invention of Mr. Dudley, he having spent eight years perfecting it, and, save one which he made and sent to Australia, his is the only one in existence.



PLAN OF BATTERY.

Besides this workroom there are a nicely furnished library and parlor, containing cabinets and a fine piano, a dining-room, kitchen, bedroom, and storeroom. All this in a common size passenger coach, and in it Mr. and Mrs. Dudley have lived for the last four years, traveling all over the United States. The lady says the life is a very pleasing one, and she enjoys it much. Both the lady and gentleman are finely educated and entertaining people, and an hour spent in their company is a very profitable one.—*Pittsfield (Mass.) Sun.*

MISCELLANEOUS INVENTIONS.

Mr. Theodule Michaut, of St. Paul, Minn., has patented an improved mill for grinding wheat, middlings, and other grains, so constructed as to produce more middlings and consequently more and better flour than mills constructed in the ordinary manner, which is so thoroughly ventilated that the surfaces do not become heated, which does not require frequent cracking and furrowing to keep it in order, and which may be run with a comparatively small amount of power.

Mr. Frederick Meyer, of Philadelphia, Pa., has patented an improved heat regulator for incubators for automatically controlling the temperature of incubating chambers. It is an improvement on a heat regulator patented by Mr. Meyer, April 29, 1879, which consisted in a lever or balance carrying a tube, with reservoirs at each end containing ether and mercury. The mercury being shifted by the expansion or contraction of the ether, the lever is thereby moved to open or close a damper. In the use of this invention it was found that high winds tended to drive a portion of the heat through the radiating tubes and thus raise the temperature of the water. The present improvement obviates this disadvantage.

Mr. Friedrich W. F. Kistner, of North Attleborough, Vt., has patented an improved bracelet, simply constructed, which locks itself automatically by means of a spring, and can be put on or taken off without requiring the hand to be passed through it. The bracelet is formed of a stiff hollow semi-circular part, to the ends of which two hollow quadrants are pivoted in such manner that they can swing in a plane at right angles to the plane of the bracelet, these quadrants being drawn inward or closed, when released, by a torsion-spring wire passing through the rigid and hinged parts of the bracelet.

Mr. Frederic A. Lane, of New Haven, Conn., has patented a clock of more compact construction than those ordinarily used, the purpose being to reduce a clock to the smallest dimensions possible without the use of fine and complicated gearing.

Mr. Jepthah G. Dunlap, of Cedarville, Ohio, has invented an improvement in breech-loading firearms. A novel construction, arrangement, and operation of a bolt for locking the barrel in place, when the breech is closed, is supplied, and also devices for operating the bolt, together with means for preventing the accidental discharge of the gun before the barrel is locked in place, and preventing the accidental unshipping of the barrel from the stock.

Mr. Joel Heacock, of Marlborough, Ohio, has patented a portable fence constructed partly of wire, which is claimed to obviate the objections to portable fences constructed wholly of either material. The fence comprises enough wood to enable it to be seen and avoided by cattle even in the night time, and at the same time presents so little surface to the wind that it is not liable to be blown down.

Mr. John J. Angus, of Cascade, Wis., has patented a blind for windows in which the slats rest upon pins driven into the rabbet of the frame of the blind, and are held by pins driven into the blind rod, which is hinged to the cross pieces of the frame on the top and bottom, and the upper end of which fits into a recess in the upper cross piece of the blind. The slats are therefore devoid of tenons and are not attached to the central rod by staples as in ordinary blinds.

Mr. Alvin O. Hall, of Cincinnati, Ohio, has patented a game which requires the player to acquire a knowledge of the census reports and of the outlines of States and countries. One or two outline maps of a country or a number of States, and a series of blocks having the names of the corresponding States or countries or counties printed thereon, with another series of blocks having the number of inhabitants of each State, country, or county printed thereon, constitute the apparatus. The accurate placing of the blocks upon the outline map, with reference to the outline or to the population, constitutes the game, in which two players may join.

Mr. John S. Van Eps, of Mammoth City, Cal., has patented an improved adjustable standard or stake for wagons, cars, or sleds, which is designed to afford convenience in loading or unloading such vehicles. Instead of inserting the stake or standard in a mortise or socket, after the usual fashion, the standard is provided with a horizontal metal socket or thimble, into which the end of the bolster is fitted, and is provided with means for holding it in an inclined or vertical position as desired.

Mr. William W. Giles, of Chicago, Ill., has patented a velocipede which embodies various improvements on the class of such vehicles that embraces three or four wheels operated by the united action of the hands and feet.

Mr. Henry T. Case, of Green Spring, Ohio, has patented a middlings purifier. A cone-shaped or tapering reel is used in connection with a fan and feed rig. The stock is carried up the incline of the reel by a light draught of air from the head to the tail, or small portion of the reel.

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Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

The property, comprising buildings, machinery, etc., formerly occupied by the New Haven Car Co., at New Haven, Conn., is for sale or lease upon very favorable terms. The location, as to railroad and tide water connections, and for securing Southern pine, lumber, and materials of all kinds at lowest cost, renders this an exceptionally favorable opportunity for parties desirous of furnishing rolling stock for railways. For further particulars address E. H. T., P. O. Box 4114, New York.

Hartshorn's Self-Acting Shade Rollers, 486 Broadway, New York. No cords or balances. Do not get out of order. A great convenience. Sold everywhere by the trade. See that you get Hartshorn's rollers. Makers and dealers in infringing rollers held strictly responsible.

For the best Diamond Drill Machines, address M. C. Bullock, 80 to 88 Market St., Chicago, Ill.

Hotchkiss' Mechanical Boiler Cleaner, 84 John St., N. Y., in use four years, recently simplified, reduced in price; no boiler should be without. Engineers make ten per cent selling other parties than employers.

NEWTON, N. C., January 31, 1881.
H. W. Johns M'f'g Co., 87 Maiden Lane, New York:
DEAR SIRS: I inclose check for last bill of paints and memorandum of what I now want.
I have used many kinds of paints, but none that equal yours in beauty of finish and durability.
Yours truly, J. B. MARTIN.

$600.—Entire Patent Valuable Household Article. H., Station F, Phila.

Pat. Steam Hoisting Mach'y. See illus. adv., p. 140.

Clark & Heald Machine Co. See adv., p. 140.

Send ten cents for Vick's Floral Guide. See adv., page 140. James Vick, Rochester, N. Y.

A Steel Pen may not be weighty, but weighty articles, reviews, and judgments may be written with them. Esterbrook's are the standard.

Colds and Coughs need immediate attention. Use Van Bell's "Rye and Rock" for either.

See "Abbe" Bolt Forging Machine notice, page 156.

For Thrashing Machines, Engines, and Horse Powers, see illus. adv. of G. Westinghouse & Co., page 125.

Buy the Buffalo Port. Forge. Have no other.

The Inventors' Institute, Cooper Union, New York. Sales of patent rights negotiated and inventions exhibited and advertised for subscribers. Send for circular.

A large manufacturing concern desires to enter into correspondence with reliable houses doing business in sinking artesian wells. Please address Drawer 81, New Haven, Conn.

Presses, Dies, and Tools for working Sheet Metals, etc. Fruit and other Can Tools. E. W. Bliss, successor to Bliss & Williams, Brooklyn, N. Y.

Street Sweeper, Smith's patent, for sale. Machinery Exchange, 261 N. 3d street, Philadelphia.

Second-hand large size Wood Planer, R. Ball & Co. make, for sale cheap, by Wm. M. Hawes, Fall River, Mass.

Wm. Sellers & Co., Steam Hammers. See ad., p. 108.

The Practical Papermaker; a complete guide to the manufacture of Paper, by James Dunbar. $1.00. Mail free. E. & F. N. Spon, 446 Broome street, New York.

Abbe Bolt Forging Machines and Palmer Power Hammer a specialty. S. C. Forsaith & Co., Manchester, N. H.

L. Martin & Co., manufacturers of Lampblack and Pulp Mortar-black, 226 Walnut St., Philadelphia, Pa.

List 25.—Descriptive of over 2,000 new and second-hand machines, now ready for distribution. Send stamp for same. S. C. Forsaith & Co., Manchester, N. H.

Send to John D. Leveridge, 3 Cortlandt St., New York, for illustrated catalogue, mailed free, of all kinds of Scroll Saws and Supplies, Electric Lighters, Tyson's Steam Engines, Telephones, Novelties, etc.

Pure Oak Lea Belting. C. W. Arny & Son, Manufacturers, Philadelphia. Correspondence solicited.

Within the last ten years greater improvements have been made in mowing machines than any other agricultural implement. It is universally acknowledged that the Eureka Mower Co., of Towanda, Pa., are making the best mower now in use, and every farmer should write to the manufacturers for catalogue, with prices.

Jenkins' Patent Valves and Packing "The Standard." Jenkins Bros., Proprietors, 11 Dey St., New York.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Wood Working Machinery of Improved Design and Workmanship. Cordesman, Egan & Co., Cincinnati, O.

The "1880" Lace Cutter by mail for 50 cts.; discount to the trade. Sterling Elliott, 262 Dover St., Boston, Mass.

Experts in Patent Causes and Mechanical Counsel. Park Benjamin & Bro., 50 Astor House, New York.

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 108.

Corrugated Wrought Iron for Tires on Traction Engines, etc. Sole mfrs., H. Lloyd, Son & Co., Pittsb'g, Pa.

Malleable and Gray Iron Castings, all descriptions, by Erie Malleable Iron Company, limited, Erie, Pa.

For Machinists' Tools, see Whitcomb's adv., page 73.

Power, Foot, and Hand Presses for Metal Workers. Lowest prices. Peerless Punch & Shear Co., 52 Dey St., N. Y.

Recipes and Information on all Industrial Processes. Park Benjamin's Expert Office, 50 Astor House, N. Y.

National Steel Tube Cleaner for boiler tubes. Adjustable, durable. Chalmers-Spence Co., 40 John St., N. Y.

Wren's Patent Grate Bar. See adv. page 109.

Best Oak Tanned Leather Belting. Wm. F. Forepaugh, Jr., & Bros., 531 Jefferson St., Philadelphia, Pa.

Saunders' Pipe Cutting Threading Mach. See p. 109.

Stave, Barrel, Keg and Hogshead Machinery a specialty, by E. & B. Holmes Buffalo, N. Y.

Wright's Patent Steam Engine, with automatic cut off. The best engine made. For prices, address William Wright, Manufacturer, Newburgh, N. Y.

Peck's Patent Drop Press. See adv., page 109.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Blake "Lion and Eagle" Imp'd Crusher. See p. 109.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 125.

The Brown Automatic Cut-off Engine; unexcelled for workmanship, economy, and durability. Write for information. C. H. Brown & Co., Fitchburg, Mass.

Clark Rubber Wheels adv. See page 109.

National Institute of Steam and Mechanical Engineering, Bridgeport, Conn. Blast Furnace Construction and Management. The metallurgy of iron and steel. Practical Instruction in Steam Engineering, and a good situation when competent. Send for pamphlet.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, importers Vienna lime, crocus, etc. Condit, Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

For Pat. Safety Elevators, Hoisting Engines, Friction Clutch Pulleys, Cut-off Coupling, see Frisbie's ad. p. 126.

For Superior Steam Heat. Appar., see adv., page 141.

Apply to J. H. Blaisdell for all kinds of Wood and Iron Working Machinery. 107 Liberty St., New York. Send for illustrated catalogue.

Brass & Copper in sheets, wire & blanks. See ad. p. 140.

Diamond Engineer, J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Eagle Anvils, 10 cents per pound. Fully warranted.

All makes and sizes of steam hammers bored out. L. B Flanders Machine Works, Philadelphia, Pa.

Machinists' Tools and Special Mach'y. See adv. p. 141.

Rubber Packing, Soapstone Packing, Hemp Packing, Empire Gum Core Packing. Greene, Tweed & Co., N. Y.

Houston's Sash Dovetailing Machine. See ad., p. 142.

Comb'd Punch & Shears; Universal Lathe Chucks. Lambertville Iron Works, Lambertville, N. J. See ad. p. 125.

New Economizer Portable Engine. See illus. adv. p. 142.

Catechism of the Locomotive, 625 pages, 250 engravings. The most accurate, complete, and easily understood book on the Locomotive. Price $2.50. Send for a catalogue of railroad books. The Railroad Gazette, 73 Broadway, New York.

Saw Mill Machinery. Stearns Mfg. Co. See p. 141.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 142.

The I. B. Davis Patent Feed Pump. See adv., p. 141.

Moulding Machines for Foundry Use. 33 per cent saved in labor. See adv. of Reynolds & Co., page 141.

For Shafts, Pulleys, or Hangers, call and see stock kept at 79 Liberty St., N. Y. Wm. Sellers & Co.

Wm. Sellers & Co., Phila., have introduced a new injector, worked by a single motion of a lever.

The Sweetland Chuck. See illus. adv., p. 141.

Skinner & Wood, Erie, Pa., Portable and Stationary Engines, are full of orders, and withdraw their illustrated advertisement. Send for their new circulars.

Burgess' Portable Mechan. Blowpipe. See adv., p. 140.

Machine Knives for Wood-working Machinery, Book Binders, and Paper Mills. Also manufacturers of Soloman's Parallel Vise, Taylor. Stiles & Co., Riegelsville, N. J.

Toope's Pat. Felt and Asbestos Non-conducting Removable Covering for Hot or Cold Surfaces; Toope's Pat. Grate Bar. Chas. Toope, M'f'g Agt., 353 E. 78th St., N. Y.

Best Turkey Emery and Star Glue, specially for polishers. Greene, Tweed & Co., 118 Chambers st., N. Y.

Use Vacuum Oil Co.'s Cylinder Oil, Rochester, N. Y.

Don't buy a Steam Pump until you have written Valley Machine Co., Easthampton, Mass.

Green River Drilling Machines. See ad. p. 125.

NEW BOOKS AND PUBLICATIONS.

MATERIALS AND CONSTRUCTION. By Francis Campin, C.E. London: Crosby, Lockwood & Co.

The aim of the author has been to produce a brief yet comprehensive, theoretical, and practical treatise on the strains, designing, and erection of massive works of construction, and to do it thoroughly without introducing the higher branches of mathematical investigation. Great stress is laid upon simplicity of calculation, the work being specially designed for those who wish to master the subject for practical application and not as a mathematical exercise.

FOUR LECTURES ON STATIC ELECTRIC INDUCTION. By J. E. H. Gordon, B.A. New York: D. Van Nostrand.

These lectures, by the Assistant Secretary of the British Association, were delivered at the Royal Institution two years ago.

ELEMENTARY PROJECTION DRAWING. THEORY AND PRACTICE. By S. Edward Warren, C.E. New York: John Wiley & Sons.

The fifth edition of a text book of industrial science drawing which has been for many years a classic. Improvements have been introduced in each division, and an entirely new division, on the elements of machines, has been added.

MODERN ARCHITECTURAL DESIGNS AND DETAILS. New York: Bicknell & Comstock. Part 5. Plates 33–40.

The fifth part of this series of designs and details of low-priced dwellings is devoted to details of cornices, belt courses, etc., doors, windows, mantels, in wood, and other construction elements. Plate 38 gives a perspective view of a handsome suburban residence, with elevations, plans, etc. The publishers have prepared a portfolio which serves the present purpose of holding the loose sheets, and will answer also for a permanent cover when the series is completed.

A STUDY OF SAVAGE WEAPONS AT THE CENTENNIAL EXHIBITION. By Edward H. Knight. Washington: Government Printing Office. 1880.

This reprint from the Smithsonian annual report of 1879 puts in convenient form Mr. Knight's valuable study of the savage weapons exhibited at Philadelphia. The 144 engravings show the forms of two or three hundred primitive clubs, axes, knives and swords, spears, shields, bows and arrows, etc. The text describes the construction and modes of using not only the weapons figured, but a multitude of related forms.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at this office. Price 10 cents each.

(1) F. G. asks how to protect apple trees from the borer. A. In the first place, be careful to remove all sprouts, suckers, and grass from the roots of the tree. Secondly, keep the bark near the surface smooth and clean by frequent scouring or rubbing with the naked hand. This should be done at least once a week during the months of May and June. This will brush off the eggs. Another remedy, and perhaps a more effectual one, is to take one pint of sulphur, add to it one gallon of soft soap, and tobacco water sufficient to make it of the consistency of common paint. Apply it with a brush in May or June on the body of the tree at the surface, and two or three inches below.

(2) R. E. H. asks how to join lead plates. A. The edges are brought together, hammered down into a channel cut out of wood and secured with a few tacks. The hollow is then scraped clean with a scraper, rubbed over with tallow, and a stream of hot lead is poured into it, the surface being afterward smoothed with a hot plumber's iron.

(3) M. M. asks: 1. Can you give me the composition of the perfume known as West End? A. 1 pint of each of the following extracts: Cassie, violet, tuberose, and jasmine; esprit de rose, triple, 3 pints; extract of musk and of ambergris, each half a pint; otto of bergamot, 1 oz. 2. How is aromatic vinegar made? A. Concentrated acetic acid, 8 oz.; otto of English lavender, 2 drachms; otto of English rosemary, 1 drachm; otto of cloves, 1 drachm; otto of camphor, 1 oz. First dissolve the bruised camphor in the acetic acid, then add the perfumes; after remaining together for a few days, with occasional agitation, filter. Vinaigre a la rose is made by shaking together 1 oz. of concentrated acetic acid with half a drachm of otto of roses. All concentrated vinegars are used by pouring three or four drachms into an ornamental smelling bottle previously filled with crystals of sulphate of potash.

(4) E. C. E writes: 1. In SCIENTIFIC AMERICAN SUPPLEMENT No. 133, a article on how to build a "working phonograph," will you please explain what is meant by the diaphragm being "damped by two or three pieces of elastic tubing?" Does it mean that short pieces of gum tubing or hose are cut off and fastened to the diaphragm; if so, what size hose and how think cut the pieces? A. Any elastic pressure will answer to damp the diaphragm; all that is necessary is to make the damping adjustable, so that the pressure may be varied to secure the best effect. Pieces of elastic rubber tube are mentioned as being the most convenient, as pieces of various sizes may be used to vary the pressure. 2. What became of the large Corliss engine used at the Centennial? A. It is running the new Pullman car shops near Chicago.

(5) D. W. C. D. writes: I have a desire to learn to be a good engineer. Where and how shall I begin? A. You should make personal application to a good engine building shop as a first step, and afterward extend your experience.

(6) W. I. T. asks for a cement that will mend a broken oil stone. A. Dissolve isinglass in the smallest possible quantity of proof spirit by the aid of gentle heat (over a water bath). In two ounces of this dissolve 10 grains of gum ammoniacum; triturate to effect solution, then add half a drachm of gum mastic dissolved in 3 drachms of rectified spirit. Stir well and keep stoppered when not in use. Liquefy by gentle heat when required for use. Clean the stone with hot potash lye, rinse thoroughly, and dry before cementing.

(7) W. E. S. writes: A friend was telling me of some coke being dumped between two large walnut trees and left there for some time, causing the trees to die, and it affected other trees in the same way some 15 or 16 feet away. Have you ever heard of a similar circumstance? His theory was that the rain washed something out of the coke which affected the trees injuriously. A. The cause assigned may have been the correct one, as gas coke from the front of the retort and imperfectly exhausted sometimes retains various hydrocarbons which are very destructive to vegetation.

(8) E. W. S. asks. Is there any practical way of making animal fat soluble in water? A. A sufficient quantity of caustic potash or soda added to a hot mixture of grease and water renders the grease soluble by saponifying it.

(9) W. W. S. asks: 1. Can electric lighting be adapted to a single dwelling conveniently and profitably? A. No. 2. What kind of a telephonic arrangement would be best and cheapest for communication throughout a two or three story house, and could one be adapted to such use without a battery, and language be conveyed so that none could hear but the one at the instrument (receiving end of course); and could or would a switch fixture be possible or advantageous? A. Speaking tubes are cheaper than telephones, and are preferable for your purpose.

(10) W. McG. asks how to recover saltpeter from damaged gunpowder. A. Dissolve the powder in warm water, filter the solution through fine linen bags, and then evaporate the water by boiling until the solution is of sufficient strength to crystallize.

(11) W. R. M. asks how to oxidize silver plated articles. A. Dissolve sulphate of copper, 2 dwts.; nitrate of potash, 1 dwt.; muriate of ammonia, 2 dwts.; in a little acetic acid. Warm the article and apply the solution with a camel-hair pencil and expose to the fumes of sulphur in a closed box. Parts not to be colored must be coated with wax.

(12) C. D. asks how to draw in gold on japanned work. A. The ornaments are formed by a camel-hair pencil with japanner's gold size, made by boiling linseed oil with gum animi and a little vermilion. When the size is nearly dry, gold powder or gold leaf is applied. In all cases where gold is fixed on by means of linseed oil, it will bear being washed.

(13) H. & B. ask how to refill a mercurial barometer so as to avoid the presence of air in the top of the tube. The bottom of the tube dips in a small jar of mercury. A. Invert the tube, and place in it a small quantity of mercury, say enough to fill the tube for six inches, then carefully heat the tube until the mercury boils. Add more mercury and boil again, and so on until it is full, then invert it in the cistern. Great care should be taken to not inhale the fumes of the mercury. If the tube is perfectly clean and the mercury pure it generally answers well enough to pour the mercury into the tube and cause the air to escape by gently jarring it.

(14) C. P. says: I have some valuable papers which were so thoroughly baked in a fireproof safe as to fall to pieces upon handling, and wish to know if there is any method of restoring strength to the paper by saturation or otherwise. A. The most successful method that we call to mind is to coat the charred sheets with collodion.

(15) C. E. F. asks: 1. Will an intensity current induce a quantity current? For example, I send a battery current through the primary coil of an inductorium, and produce an induced current in the secondary coil. Now, if I send that current through the secondary coil of a precisely similar inductorium, will it induce a quantity current, like the original battery current, in the primary coil? A. No. 2. Is an induced current always of greater intensity and less quantity than the inducing current? A. Yes. 3. In the first case above, which current would overcome the most resistance in flowing through a circuit, the galvanic or the induced current? A. The induced. 4. Which would overcome the most resistance, the induced current in the secondary coil, or the "extra currents" in the primary coil? Supposing the "extra currents" and the galvanic current to meet the resistance, which would be stopped and which pass through the resistance? A. They are of much the same nature, and, under like conditions, we think there would be no difference. 5. Where can I purchase Faraday's 158 philosophical papers called "Experimental Researches on Electricity," and what is the cost? A. Write the industrial publishers who advertise in our columns. 6. Have you published an index to contents of SUPPLEMENT before the half year ending December 31, 1880? A. Yes. 7. The SUPPLEMENT is a very valuable paper, but the lack of an index has been a great drawback heretofore. In how many volumes back have they had the index? A. Every volume is indexed.

(16) J. G. writes: If a machine run at a speed of 50 revolutions, and then the speed is increased to 100, will it require twice the amount of power? Three-fourths of the power is consumed in friction. What proportion of power will it require to maintain the above speed? A. The power required to overcome the friction will increase as the speed; if the work done by the machine in a given time is doubled, the power must be doubled.

(17) W. T. D. writes: 1. I am making an induction coil (for shocking) according to directions in SUPPLEMENT, No. 160. My coil measures 4½ inches between the heads, with a center core of No. 18 iron wire five-eighths inch diameter. Primary coil consists of two layers of No 18 cotton covered and well insulated from each other. The secondary coil consists of 1,000 feet of No. 32 cotton covered copper wire well insulated from the primary coil, and with one Grove cell I do not get a current strong enough to feel above the elbows. The secondary was wound in a continuous coil from end to end, but has been unwound, and I will try winding in halves with an insulating medium in the center according to directions. Where is the fault with my coil—I do not use a condenser? A. Your secondary wire is too large and not long enough. Use No. 36 or No. 40, and double the length. It would be an improvement if you were to use three layers of primary wire instead of two. 2. How can I govern the current given out of this coil by sliding a cylinder over the coil? A. The cylinder is a simple brass cover sliding over the coil. You can make a greater variation by soldering together the iron wires of your core and allowing them to slide with the cylinder.

(18) M. C. writes: I have a house built on the bank of a small stream. The bank is about 30 feet high, and the house is distant from the water about 100 feet. I cannot easily get water by digging near the house. The soil is sandy. What would be the best, cheapest, and easiest way of getting the water from the stream to the house? If by damming the stream to 3 or 4 feet of a head could it be made to send the water that height by means of a small endless chain or copper wire carrying very small buckets? A. By damming the stream so as to get 4 to 6 feet head, you can use a hydraulic ram to elevate water to your house.

(19) Z. M. L. asks if there is any process of toughening pressed glass (say pieces 2 inches square, one-eighth inch thick) so that they would bend slightly and not break. Could they be colored black? A. We know of no satisfactory way of toughening the glass after pressing. The glass may be colored in the pot by introducing a suitable quantity of a soft glass highly charged with strongly calcined umber and reduced to powder. It may be superficially stained by coating the

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surface with a mixture of 1 part highly calcined umber and 2 parts of borax ground to a fine powder, and then heating the glass in an oven until the coating becomes vitrified. Consult "A Treatise on the Origin, Progressive Improvement, and Present State of the Manufacture of Porcelain and Glass." Address the bookdealers who advertise in this paper.

(20) S. A. H. writes: I have for some time been using a gasoline gas machine which I have made, but I find it rather unsatisfactory, as the gas when burning in a close room gives an unpleasant odor causing headache. A. The cause of the bad odor is doubtless due to the supersaturation of the air with the vapor of gasoline, so that the combustion is imperfect, certain hydrocarbons mixed with much carbonic oxide escaping unconsumed. 2. I cannot get from a gallon of gasoline 88°, more than 100 feet of gas, or the equivalent in light of 100 feet of good coal gas. How much should I get from a gallon? A. About 118 feet under favorable circumstances. 3. My blower is of peculiar construction, and the air when entering it has to pass through a fine spray of water, and thus become saturated with watery vapor. May the odor not be caused by a partial decomposition of this vapor while passing through the flame? I am led to think so from the fact that during intense cold the gas burns without odor, in which case I think the watery vapor is retained in the pipes by freezing. A. The odor is not due to the water. See article on gas machines, page 1, vol. xliii.

(21) "Subscriber" asks: Can you tell of anything that can be worn or used to destroy body odors that daily bathing will not accomplish? Also a deodorizer for bedrooms and bedding? A. Add a little soda to the water used for bathing, and bathe frequently. Frequent changes of bed linen and plenty of airing are the most practical means.

(22) W. S. asks for a method of hard soldering solid gold set rings such as amethyst, cameo, garnet, etc., which will not crack or change the color. Please let me know what mixture, or what would be best. A. Jeweler's solder with gold of a somewhat lower title than article to be soldered—borax, flux, and blow pipe, enveloping the other parts with tissue paper and whitening or plaster of Paris.

(23) A. M. G. asks for a receipt for making a blue colored fire, same as used in fireworks. I have tried receipts with only sulphur, nitrate of potassa, and antimony, but they are not satisfactory. I think that realgar (red arsenic) or orpiment (yellow arsenic) are used, but what proportions of each I do not know. Please give me some receipts which you may know to be good and not be very expensive. A. 1. (For theatrical fires, etc.)—Sulphur, sulphate of potassa, and ammonio-sulphate of copper, each 15 parts; niter, 27; chlorate of potassa, 28. 2. Sulphate of copper, 7 parts; sulphur, 24; chlorate of potassa, 69. 3. (For pyrotechnic mixtures)—Chloride of potash, 9 parts; sulphur and carbonate of copper, each 3 parts 4. (For lances)—Chlorate of potassa, 6 parts; Chertier's copper, 1; calomel, 5; sugar, 4.

(24) E. F. H. asks for information as to curing, removal of fat, and the fishy odor of bird skins, especially salt water birds. I do a great deal of gunning, and should like to prepare some good skins. A. Scrape off as much of the flesh and fat as possible with a blunt knife, and immerse them for 48 hours or more in the following solution: Salt, 4 lb.; alum, 1 lb.; water, just sufficient to dissolve. On removing wash in a weak solution of soda and water.

(25) H. M. P. asks: 1. How much power is required to drive the dynamo-electric machine described in No. 161 of the SCIENTIFIC AMERICAN SUPPLEMENT? A. About one-sixth of a horse power. One man power will drive it. 2. Will a piece of wrought iron pipe 8 inches in diameter do for the shell of a small boiler? What pressure would it stand? A. Yes; it would probably stand 200 lb. per square inch safely, but should be tested to 400 lb. before being put in use.

(26) E. E. T. asks: 1. Could I obtain good results by constructing a dynamo-electric machine with electro-magnets consisting of a piece of gas pipe (wrought iron) of extra thickness, split lengthwise so as to form the two poles, and wound circumferentially with wire? Also, would the armature made of a cross-shaped section be any better than if made according to Dr. Siemens' plan? I constructed a machine, as described in SCIENTIFIC AMERICAN SUPPLEMENT, No. 161, and am much pleased with it. A. A dynamo machine constructed according to your plan would prove a failure. 2. I am working in a sugar house with a view of learning the business. Do you consider the analysis of sugar a special branch of chemistry, and how long would it take a man of average intelligence to learn it? A. Yes. To become expert in the use of the saccharometer under favorable circumstances does not require many weeks' study. To become thoroughly acquainted with sugar chemistry may require a year of application. 3. Will sponge platinum become luminous in ordinary coal gas? A. Yes, when freshly prepared. 4. In making phosphorescent sulphides, as described in SCIENTIFIC AMERICAN of February 5, 1881, is it necessary to heat red hot? A. Yes.

(27) W. T. asks: 1. What is meant by electroplaters' machines, and is any apparatus necessary for silver plating besides Bunsen's battery? A. Dynamo-machines, used in large electroplating establishments in place of batteries. 2. Can I obtain any publication with the latest methods for electroplating? A. See pp. 81, 116, 3, and 33 current volume, and 153, vol. xliii., SCIENTIFIC AMERICAN. 3. How is aqua-ammonia, as sold in the drug stores, prepared, and can I prepare it for my own use and how? A. Usually by decomposing the ammonia salts such as the chloride (sal-ammoniac) by means of lime, with the aid of heat, and passing the ammonia (gas) evolved into water which absorbs it and becomes aqua-ammonia (ammonia water).

(28) W. C. asks for a receipt for a good black polish for leather suitable for cartridge boxes and belts. I want a polish that will not wash off, and make a good appearance at inspection. A. Shellac, 12 parts; white turpentine, 5; gum sandarac, 2; lampblack, 1, spirit of turpentine, 4; alcohol, 96. Stir and digest in a covered vessel until solution is complete. 2. What is the cause of center punches and cold chisels becoming magnetized when used for a short time? I think it is caused from the friction of the center punch on the iron. A. The magnetism is derived by induction from the earth. Articles of steel when held in certain positions and repeatedly struck become magnetic.

(29) D. A. S. asks: Is there any known substance that, if placed between a magnet and steel, will prevent attraction? A. No.

(30) C. M. E. asks: 1. To what height will an ordinary steam suction pump lift (not force) water and work successfully? A. About 26 feet. 2. In ascertaining such height in the winter, when the river is frozen over, would you measure from the top or under side of the ice? A. Underside.

(31) J. R. K. writes: In your January number of SCIENTIFIC AMERICAN, in answer to J. R. S. No. 35, you give following receipt for making those pads, etc.: "Water, 130 parts; sulphate of baryta, 75 parts; sugar, 30 parts; gelatine, 30 parts; glycerine, 180 parts." Wanting one of the articles badly, I took your paper to a chemist in this city, to have the articles prepared, and he informed me that sulphate of baryta was insoluble in water, and he advised me to send East (there being none of the article in this town) for a pound of sulphide of barium. Will you in next issue of your paper let me know about correctness of the above, also whether sulphide of barium will answer for sulphate of baryta, as stated in receipt? A. The sulphate of baryta is simply mixed, not dissolved; it gives consistence and color to the composition. The sulphide cannot be used instead.

(32) G. A. N. asks: What is the best way to remove white paint from the surface of white pine house stair steps? A. Moisten the paint well with naphtha or good benzole, repeating as often as necessary. As soon as the paint becomes soft remove by means of a rag, aided by a scratch knife and stiff brush, moistened with the naphtha or benzole. A strong aqueous solution of caustic potash is sometimes used to destroy such paint, but it is apt to stain the wood or unfit its surface for receiving a fresh coat at once.

COMMUNICATIONS RECEIVED.

On a Meteor. By C. P. K.
On Extraordinary Parhelia of the Sun and Venus.
On Remarkable Parhelia. By M. B.

[OFFICIAL.]

INDEX OF INVENTIONS

FOR WHICH

Letters Patent of the United States were Granted in the Week Ending

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AND EACH BEARING THAT DATE.

[Those marked (r) are reissued patents.]

A printed copy of the specification and drawing of any patent in the annexed list, also of any patent issued since 1866, will be furnished from this office for one dollar. In ordering please state the number and date of the patent desired and remit to Munn & Co., 37 Park Row, New York city. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications not being printed, must be copied by hand.

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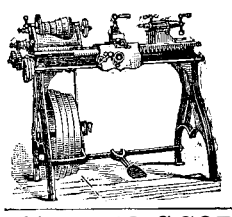

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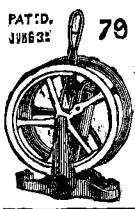

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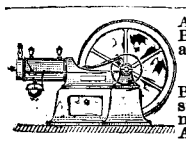

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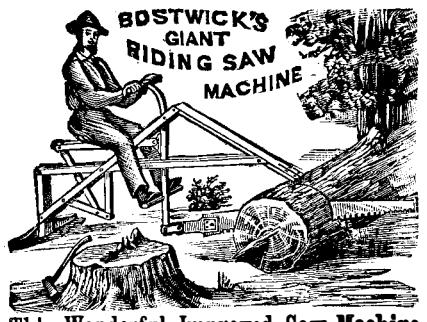

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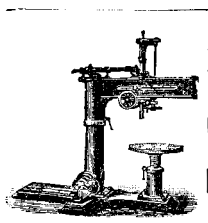

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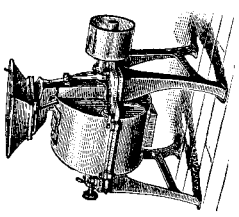

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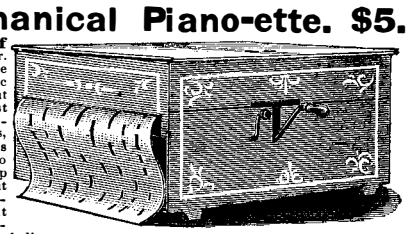

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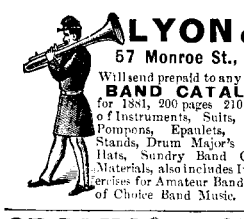

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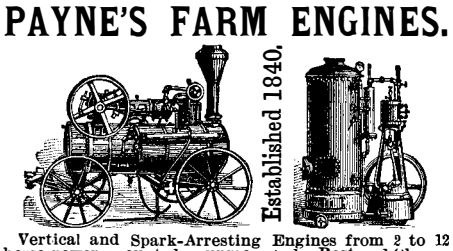

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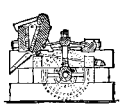

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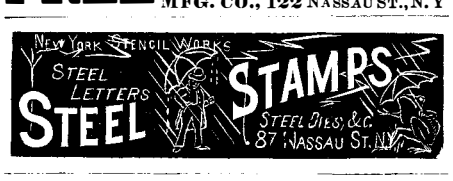

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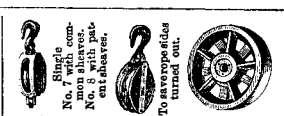

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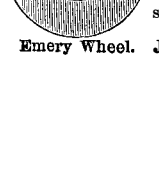

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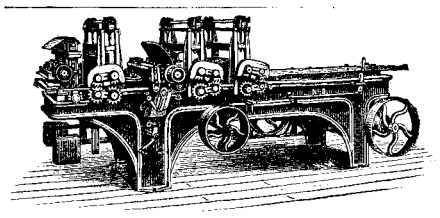

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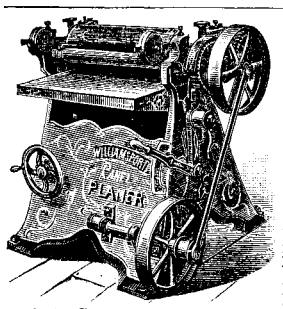

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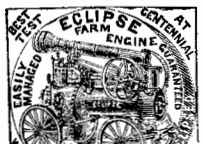

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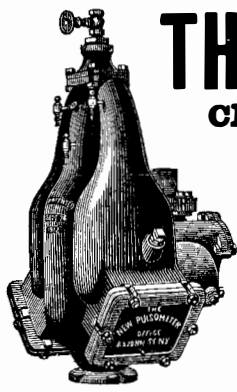

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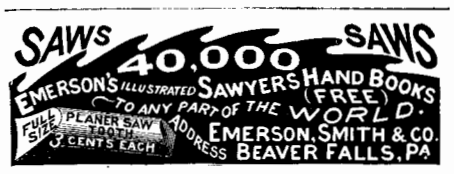

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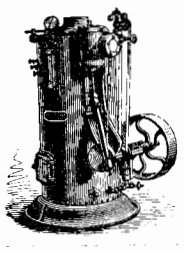

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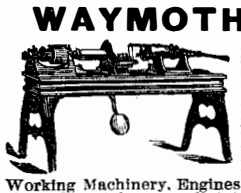

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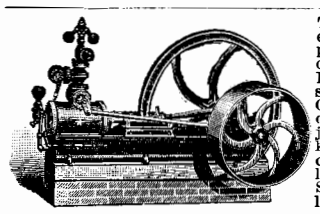

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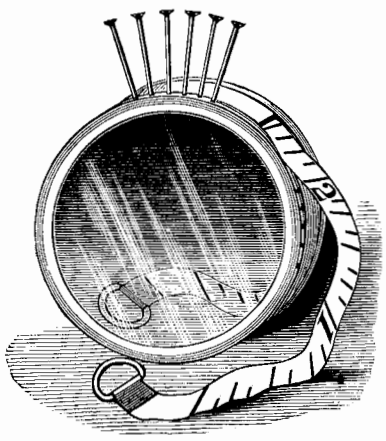

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